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THE MESSINA EARTHQUAKE.

BY

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On May 3rd, 1887, an earthquake might have been felt in many places scattered throughout about one-half of Old Mexico, as well as over two-thirds of Arizona and New Mexico. This shock was not chronicled in the world's centers of culture, and even up to the present it has been vouchsafed but little attention; yet it was undoubtedly a far heavier shock than that which has just stirred the emotions and aroused the sympathies of the entire civilized world. The area of the destructive shocks of the earlier disturbance exhibits an alternation of mountain and arid plain, much of it inhabited only by Indian tribes with a few scattered ranches and mining camps. Had it been much more thickly settled than it was, it is probable that the loss would have been small. If an army in tents had been encamped upon the site of Messina on the morning of the 28th of December last, the loss to life and property would have been insignificant. This should teach us that though earthquakes may not be prevented, and up to the present have not been definitely forecasted, the destruction which they cause is very largely of man's own making.

If no city had ever been builded upon the site of Messina, it would be a relatively simple matter to establish there a new community housed in essentially earthquake-proof structures. To remove the wreckage of the old city will be, as President Roosevelt has so well said, a task for Titans. The cost of building an earthquake-proof city is greater than that of the usual type by perhaps

one-half or even more; but there should on this account be no hesitation with such an object lesson before us. How such a city may be constructed has long been known in part, and the study of the recent California earthquake has furnished a definite answer to many of the problems before unsolved. Methods of building are not, however, the subject of this paper, but in a forthcoming number of the *Engineering Magazine*, the present writer has set forth the more important of the considerations involved.

So much has been written about the recent Messina earthquake under the mental shock of the terrible suffering and loss of life, that it is necessary first of all to correct a certain amount of misconception and error. Enough has now appeared in print from the pens of scientific writers to make this possible, though a considerable body of such papers has been written before reliable data could be obtained. The most important of the papers which have already been issued have been written by Perret,* and Wright,† who have been upon the ground since the disaster.‡ By a remarkable combination of circumstances, Mr. Perret reached Messina on the North German Lloyd's steamship *Therapia*, the first vessel from the outside world to reach the scene of the disaster. His familiarity with the region and his knowledge of the Italian language, gave him opportunities not possessed by most foreign students. Other articles treating of the earthquake, written by geologists in some cases in advance of definite information, have been interesting as expressions of opinion concerning the cause of earthquakes, or have dealt with methods which might be adopted in the investigation of such phenomena.§ Again, there have

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* Frank A. Perret, "Preliminary Report on the Messina Earthquake of December 28, 1908." *Am. Jour. Sci.*, 4th Ser., Vol. 27, April, 1909, pp. 321–334. See also "The Messina Earthquake," *The Century Magazine*, Vol. 77, April, 1909, pp. 921–927.

† Charles W. Wright, "The World's Most Cruel Earthquake," *Nat. Geogr. Mag.*, Vol. 20, April, 1909, pp. 373–396.

‡ Since this paper was written has appeared a valuable paper by Dr. Martinelli of the Central Office for Geodynamics and Meteorology at Rome (Osservazioni preliminari sul terremoto Calabro-Messinese del màttino del 28 dicembre, 1908. (*Boll. Bimen. della Soc. Met. Ital.* Ser. 3, Vol. 28, 1909, pp. 1–11. 2 Maps.)

§ Gaetano Uzzielli, "I terremoti Calabro-Siculi del 1908–1909." *Rivista Geografica Italiana*, Ann. 16, Jan.–Feb., 1909, pp. 44–58.

M. A. Lacroix, "Résumé de quelques observations de M. A. Riccò sur la tremblement de terre de Sicile et de Calabre du 28 décembre 1908." *C. R. de l'Acad. Sciences*, Paris, Vol. 148, Jan. 25, 1909, pp. 207–209.

William H. Hobbs, "The Latest Calabrian Disaster," *Pop. Sci. Month.*, Vol. 74, February, 1909, pp. 134–140.

——— "Das italienische Erdbeben vom 28. December 1908," *Globus*, Vol. 95, Feb. 25, 1909, pp. 110–112.

James Geikie, "Calabrian Earthquakes," *Scot. Geogr. Mag.*, Vol. 25, March, 1909, pp. 113–126.

R. D. Oldham, "Recent Earthquakes," *Geogr. Jour.*, Vol. 33, March, 1909, pp. 294–297. (See also the February number of the same journal.)

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PLATE 1.—ONE OF THE PRINCIPAL RESIDENCE STREETS OF BAGNARA.
Here, as through all the devastated regions, shattered walls are being torn down as fast as circumstances permit.

appeared articles written by skilled observers and writers not primarily of a scientific character, but which include data of much general interest, for the psychology of a great earthquake cannot be wholly overlooked by the student of the physical phenomena.*

First of all it should be stated that the sympathetic volcanic phenomena first reported from Etna and the Lipari Islands (and also Virginia) did not occur (Riccò). Perret reports that both Etna and Stromboli were unusually active on December 25th, but "Neither showed sympathetic action at the time of the quake or immediately after." Just so at the time of the Calabrian earthquake of September 8, 1905, it was credibly reported that Stromboli had been thrown into quite an unusual state of activity. This report has been incorporated into the scientific literature of the earthquake, but a later and more thorough study shows it to have been without foundation.† This conclusion is, morover, in confirmation of experience both in this and other districts.

Again, it was claimed that the Lipari or Eolian Islands had disappeared, which would have indicated a most remarkable change in level of the sea bottom in the vicinity. This was, as could have been confidently stated by any seismologist, only a rumour of the kind that finds ready credence at such a time.

In a general way, experience has shown that a great earthquake renders a district comparatively immune from destructive shocks for a period usually measured at least in decades. The recent Calabrian disaster, coming as it did after the destructive shocks of 1905 and 1907, seemed at first to offer an exception to this rule. A more careful examination, in the light of all the facts, rather confirms than contradicts the general principle which has been established. If we recall the greatest of the earlier earthquakes in the same region—that of 1783, with its death roll of 30,145 and its property loss, according to Baratta, of more than three billions of dollars‡—we find that in this instance there were two main destructive shocks, one of which occurred on February 5th and the other on March 28th of the same year. The first of these destroyed especially the towns in the western section of Calabria and those across the Strait in Sicily; whereas the later one affected particularly the borders of the great granite masses lying to the eastward. If we regard an earthquake as a local "letting down"

* F. Marion Crawford, "The Greatest Disaster of History." *The Outlook*, April, 1909, pp. 673-690. Robert Hichens, "After the Earthquake." *The Century Magazine*, Vol. 77, April, 1909, pp. 928–939.

† Gaetano Platania, "Il terremoto Calabrese dell' 8 settembre 1905 a Stromboli." *Mem. della Classe di Scienze della R. Accademia degli Zelanti*, 3a serie Vol. 5, 1905–6, pp. 79–87.

‡ In Calabria 29,515 persons and $26,000,000. Baratta, *I terremoti d' Italia*, Turin, 1901, p. 288.

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PLATE 2.—PIAZZA IMMACULATA AT VILLA SAN GIOVANNI.
Many survivors remain at the scene of their former homes and are supplied with food by relief committees.

of the strains which exist in the rocks due to the continuous action of compressive forces, as is now more and more generally held by geologists, then such a partial and local operation of the process is to be expected. Larger displacements which result from this letting down by instalments throughout extended zones which encircle the globe, have been observed to alternate throughout the zone, and so far as a rather indefinite kind of earthquake forecast has been possible, it has been on the basis of this hypothesis.*

If now we examine the Calabro-Sicilian province during the last few years in terms of this hypothesis, we find that earthquakes of strong or destructive violence visited it on November 16, 1894,† September 8, 1905,‡ October 23, 1907,§ and December 28, 1908.

The shock of 1894 resulted in the death of over 100 persons, while 460 were severely and more than 500 slightly wounded. The property loss in Calabria was estimated at $5,000,000, or about that of the Charleston earthquake of 1886; and in addition, within the province of Messina, some 200 houses partially collapsed, and almost 10,000 others were more or less damaged. The earthquake of 1905 destroyed the lives of 529 persons, severely wounded 877 others, and resulted in a property loss officially estimated at nearly $10,000,000. In the quake of 1907 the death loss was 175, besides which some fifty or more persons were wounded. Of the property loss no estimates are known to the writer. Measured thus in terms of the damage which they have wrought, each of these quakes is properly rated as of destructive violence.

The maps inserted here (see Figs. 1–2) show the distribution of the communes and fractions thereof in which damage resulted from the shocks; and from this it will be seen that though the shocks of 1894 disturbed the shores of the Messina Strait, the others were restricted to the province of Calabria, and but little affected even the eastern shore of the Strait. In the figures the crosses and dots, which indicate respectively the points of greater and less damage, are relative only for each individual shock, and

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* G. K. Gilbert, "Earthquake Forecasts." *Science*, Vol. 29, Jan. 22, 1909, pp. 121–138.

† A. Riccò, "Riassunto della sismografia del terremoto del 16 Novembre, 1894, in Calabria e Sicilia." *Boll. della Società Sismologia Italiana*, Vol. 5, 1899–1900, pp. 157–180.

‡ William Herbert Hobbs, "Calabrian Earthquake of September 8, 1905," *Bull. Geol. Soc. Am.*, Vol. 17, 1905, pp. 720–721. Also, "Geotectonic and Geodynamic aspects of Calabria and northeastern Sicily," Gerland's *Beiträge zur Geophysik*, Vol. 8, 1907, pp. 293–362, pls. 2–11. Also, Baratta, "Il grande terremoto Calabro dell' 8 settembre 1905," *Proc. Verbali della Soc. Tosc. di Sci. Naturali.* November, 1906, pp. 1–8. Also, "Il grande terremoto Calabro dell' 8 settembre 1905," I, Osservazione fatte nei dintorni di Monteleone. *Atti della Soc. Tosc. di Sci. Naturali, Mem.*, Vol. 22, pp. 1–26. G. Mercalli, "Sul terremoto Calabrese del 23 ottobre 1907." *Boll. Soc. Sism. Ital.*, Vol. 13, 1908, pp. 1–8. Map.

§ M. Baratta, "Il recente terremoto in Calabria (23 Ottobre, 1907)." *Revista d' Italia*, Nov., 1907, pp. 754–761.

FIG. 1.

Maps to show the distribution of damage from the earthquake shocks of September 8, 1905, and October 23, 1907, within the province of Calabria. The crosses indicate the position of communes and fractions thereof which were more seriously damaged.

no comparison of intensity is possible between the different maps. The shocks of 1905 were extremely slight on the Calabrian coast of the Strait, despite the early report that Reggio and other places had been completely destroyed. Not a crack was made in the walls of any house in Reggio at this time. The heavier shocks were to the northward in the valley of the Mesima to the west of the Calabrian mountains, whereas the heavy shocks of 1907 were largely restricted to the area southeast of the same elevated masses.

Though the current reports of the recent earthquakes mention damage mainly in the coastal towns, it is almost certain that later reports will show that damage has been great in many of the small hill towns, their sufferings being, for the time, eclipsed by the greater catastrophe in Messina and Reggio. The commission of surgeons which left the coast and struck inland in Calabria a few days after the main shock, found many towns in which most of the houses had collapsed with consequent great loss and destitution.*

The late earthquake in Calabria and Sicily came without any recognized warning at 5:20 A. M., December 28, 1908, the initial shock continuing for about 32 seconds. By some of the refugees this shock is said to have been preceded for a few seconds by a singing sound like a far away wind storm, which sound rapidly developed into a rumble and roar when the movement began to be felt (Perret). In the city of Messina itself there was a Vicentini seismograph set up within a specially constructed earthquake cellar, and this instrument continued to register the earth vibrations until the arrival of the heaviest shock. From its records it appears that ten minutes before the main shock, there was a very light movement which increased for ten seconds and then faded away in intensity during a second period of the same length. As with all great earthquakes, the initial heavy shock was followed by others. At Catania, fifty were registered during the first day, each of them less heavy than those that went before. During the night of the 29th, thirty-eight shocks were felt at Messina. Two of the after-shocks of the first ten days which succeeded the disaster were much more heavy than those which had just preceded them. On January 2 at 9:40 P. M. there was a shock heavy enough to throw down walls in Messina which had not been completely leveled by the initial shock. Also at 6:28 P. M., January 7, there were shocks heavy enough to fell some of the walls which were then still standing (Perret).

* Oldham, *Geogr. Jour.*, March, 1909, pp. 294-295.

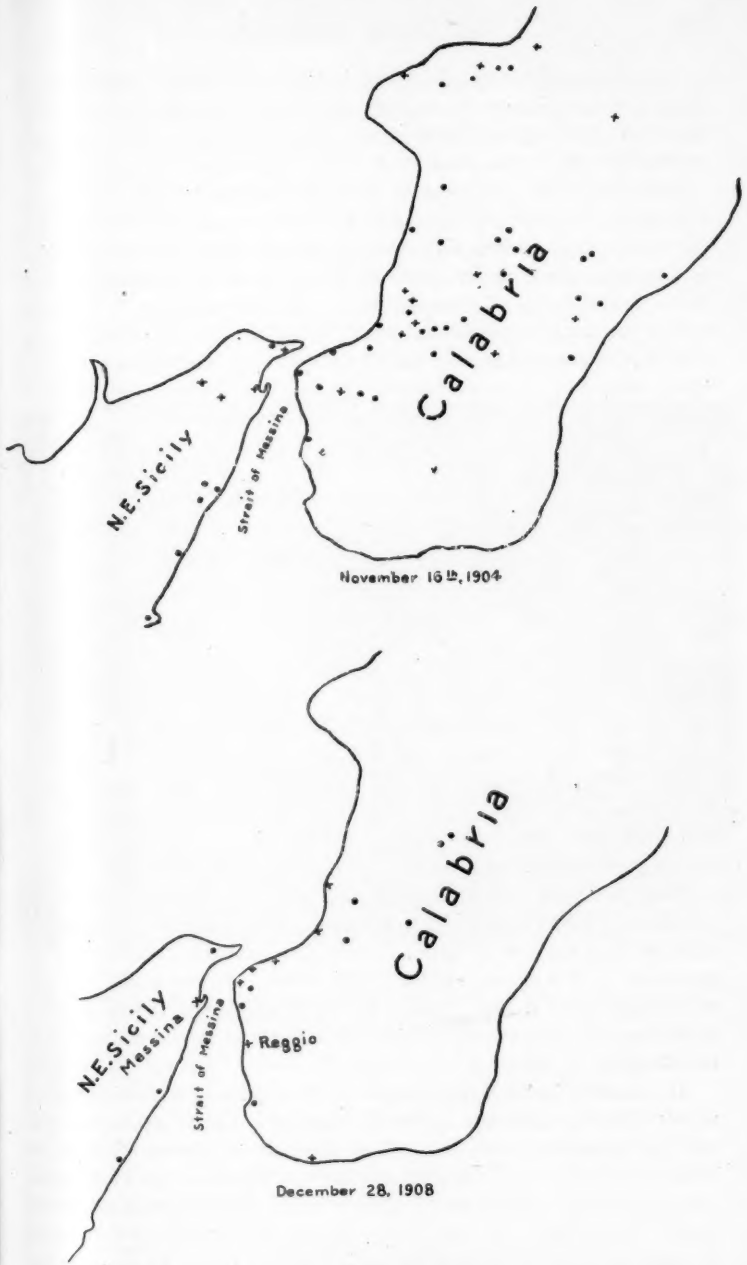

FIG. 2.

Maps to show the distribution of the damage from the earthquake shocks on November 16, 1904, and December 28, 1908, in the province of Calabria and in northeastern Sicily. For the earthquake of 1908 the map is only preliminary and partial.

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The water wave which rolled in upon Messina a few minutes after the first heavy shock, was much less formidable than first reported. According to Perret, its height at Messina did not exceed 9 feet, though it was somewhat higher at Reggio; but it reached a maximum height on the west coast of the Strait below Taormina. According to Riccò, its height at Messina was 7½ feet, at Villa San Giovanni, in Calabria, 12½ feet, at Reggio 10½ feet, at Pellaro, in Calabria, about 13 feet, and at Giardini near Taormina and at Riposto 19½ feet. This water wave extended southward from the Strait, reaching Cape Schisò near Taormina 35 minutes, and the Island of Malta 115 minutes after the initial shock was felt at Messina. Villa San Giovanni, across the Strait of Messina, is reported by Perret to have received the wave a few minutes later than Messina. The water wave was preceded by a retreat of the water from the shore.

A separate water wave appears to have been formed within the sea north of the Strait of Messina, since it was felt at Termini Imerese, about 20 miles east of Palermo. According to Uzzielli, a sea wave was also registered at Laguna Veneta off the city of Venice. At Reggio near the railroad station, which is situated on the shore, water shot up in jets out of the ground under great pressure, a feature which is common to nearly all great earthquakes. Along the water front at Messina the quay, which before the earthquake was at the fish market 6½ feet above sea level, is now submerged. The shore seems to have dropped down in step-like terraces, which are possible of explanation either from local depression of the ground, due to vertical movements of sections of the crust, or from a lurching of loose materials toward the Strait under the influence of the shocks.

The preliminary soundings within the Strait since the earthquake are reported to indicate a change of depth (Riccò), but no definite data are yet at hand. Such changes are, however, to be expected, and it is not unlikely that other changes would be discovered by careful soundings in the Tyrrhenian and Ionian depressions located respectively to the northwest and to the southeast of the Strait of Messina.

It has already been mentioned that the greater part of the loss, which Messina and the other Sicilian and Calabrian cities and villages have just suffered, might have been prevented by the observation of proper building methods. Was the city of Messina wholly ignorant of this fact? Surely it has not been without warnings of its danger. In 1783 it was largely destroyed, the estimated damage as given by Baratta having been in excess of $3,000,000,000

(if measured by present values), as against $26,000,000, the total loss in all Calabria at the same time. * It has long been known that masonry is particularly unsuitable for building in earthquake districts, and if used at all it must be upon good foundations and be well bonded and mortared and in structures of moderate height only. Notwithstanding this fact, most of the houses in Messina were constructed of loose rubble in a weak mortar and with floor joists supported without fastenings in shallow mortisings of the walls. The building laws had often been violated in the excessive heights of the buildings. If a more perfect human deadfall could be constructed, it was, and still is, to be found in the Calabrian

FIG. 3.

View of the ruins of the little village of Piscopia after the earthquake of September 8, 1905. In the foreground, note the pile of heavy tiles which have been collected from the debris.

villages, where wall construction of the same type is surmounted by heavy tiles laid upon poles to form the roof (Fig. 3).

After each fresh disaster in Calabria, there has always been some one to point a moral and to urge the use of rational building methods in reconstruction. Fortunately after the shocks of 1905 the plans of the *Comitato Lombardo* were adopted in the new con-

* In Messina only 617 of the inhabitants were killed and in all Sicily only 630.

struction undertaken, and those villages which were largely destroyed, have now been reconstructed with barracks which, if not earthquake proof, are at least comparatively safe.* (See Fig. 4.) Ferruzano, in Southeastern Calabria, which was not damaged during the shocks of 1905, but suffered greatly during those of 1907, was apparently rebuilt under similar control, for we are informed that though the recent shocks were heavy there, no harm was done to the newly constructed buildings. A new era has fortunately dawned for Calabria and Sicily, and a sufficiently striking object lesson is to make proper construction a necessity in all

FIG. 4.

View of the new barracks for the peasants in the hill town of Martirano Nuovo, Calabria, constructed on the plans of the *Comitato Lombardo* since the earthquake of September 8, 1905 (after Baratta).

ruined villages. It is too much to hope that those villages which have just escaped, will at once replace their man-trap houses by properly constructed ones, and more disastrous earthquakes may first be necessary. Calabria and Sicily as a whole are still in the age of masonry with which their history began; but the age of wood and of reinforced concrete has now been inaugurated, and the American villages which have been and are still being constructed at Messina, Reggio, Villa San Giovanni, and in scores of other communes, with groups of from 20 to 1500 wooden cottages

* Baratta, "Le nuove costruzioni in Calabria dopo il disastroso terremoto dell' 8 settembre, 1905." *Boll. Soc. Sism. Ital.*, Vol. 12, 1908, pp. 249-337.

each, cannot but greatly hasten the dawning era when all Calabria and Sicily shall be protected from its greatest scourge.*

If the cause of the Messina earthquake is asked, it may with some confidence be referred to a sudden relief from local stress due to adjustments of the earth's crust. It is the writer's belief that this adjustment during Calabrian earthquakes has taken place in such a way that individual sections of the crust moved as units between the lines of fracture which bound them. The zones of greatest destruction from the disturbance are recognized to be coincident with lines of fracture, which have been the seats of movement in many earlier earthquakes as well. Perret, following Mercalli, has ascribed the recent movements to a local transfer of deep-seated molten rock (magma), which Mercalli has made a special class of earthquake designated "inter-volcanic." It is highly probable that most earthquakes are of this kind, for we know that great sections of the earth's surface are moved sometimes a distance of many feet in a direction either vertical or horizontal, or generally both, during a great earthquake. Now unless this movement be regarded as purely superficial and affecting only the loose unconsolidated deposits which lie upon the rock basement, and such a view is quite untenable, it is necessary to assume for each vertical movement a horizontal transfer of material beneath the surface. It seems further necessary to assume that this transfer occurs at such a depth below the surface that local removal of load would result in fusion of the rock. Now geological studies have shown that earthquakes are the local jolts which result from interrupted movements of the land progressive throughout centuries.

Thus the earthquakes of the California coast are a necessary manifestation of an uplift of the coast in some sections accompanied by a depression of other portions of the shore, and these molar movements cannot be assumed to take place without a transfer of material—presumably molten—from beneath the country that is sinking to beneath that which is rising: †

This conception is in no way opposed to the view that the earth as a whole is essentially solid, which there is strong reason to

* Since the above was written has come the news of definite action by the Italian Government. On the 18th of April, 1909, by royal decree No. 193, a set of regulations was promulgated which must be adhered to "in repairs, reconstructions, and new constructions of the edifices public and private in the villages damaged by the earthquake of December 28, 1908, or by other earlier ones." These regulations have been published by the Italian Ministry of Public Works on April 23, 1909. (Ministero del Lavori Pubblici, Norme techniche ed igieniche obbligatorie per le riparazini, etc., *Boll. Uff. del Minist. del Lav. Pubb.*, Rome, 1909, pp. 57. Also "Relazione della Commissione incaricata di studiare e proporre norme edilizie obbligatorie per i comuni colpiti dal terremoto del 28 dicembre, 1908, e da altri anteriori." Rome, 1909, pp. 111, map.

† See "Earthquakes, an Introduction to Seismic Geology," Appleton, 1907. pp. 33-36.

believe. The core of the earth, if solid, must be so by reason of the pressure upon it, and a local relief of this pressure in the superficial portion due to a local uplift, would temporarily cause fusion of some of the rock, and so permit of lateral migrations. Mercalli's "inter-volcanic" type of earthquake is thus in all probability the normal one, and is connected with changes in level of the earth's surface. Wherever, therefore, portions of the continent are rapidly undergoing changes of level, and such are for the most part in the neighbourhood of the sea coast, there earthquakes must be expected.

It is vain to hope against hope that earthquakes will not return to regions which they have already visited in the past. It is quite within the range of possibility that more careful study by geologists of the rate of uplift within definite dangerous zones, may throw some light upon the future frequency and intensity of earthquakes, in those cases where historic records are insufficient for the purpose. In the writer's opinion, the study of earthquakes, from the geologist's view point, is certain to focus attention more and more upon study of the rate of oscillation of level measured in terms of wave-cutting on shores and of stream erosion as well. It was with studies of this nature that geology was concerned in its beginnings, but attention has since drifted away from the subject. There are, however, few problems of geology to-day so pregnant of important discoveries in the future.

UNIVERSITY OF MICHIGAN, May 18, 1909.

THE OPERATION OF GEOGRAPHIC FACTORS IN HISTORY.*

BY

ELLEN CHURCHILL SEMPLE.

Man is a product of the earth surface. This means not merely that he is a child of the earth, dust of her dust; but that the earth has mothered him, fed him, set him tasks, directed his thoughts, confronted him with difficulties that have strengthened his body and sharpened his wits, given him his problems of navigation or irrigation, and at the same time whispered hints for their solution. She

* Address delivered before the Ohio Valley Historical Association at its annual meeting, Marietta Ohio, November 27, 1908.

has entered into his bone and tissue, into his mind and soul. On the mountains she has given him leg muscles of iron to climb the slope; along the coast she has left these weak and flabby, but given him instead vigorous development of chest and arm to handle his paddle or oar. In the river valley she attaches him to the fertile soil, circumscribes his ideas and ambitions by a dull round of calm, exacting duties, narrows his outlook to the cramped horizon of his farm. Up on the wind-swept plateaus, in the boundless stretch of the grasslands and the waterless tracts of the desert, where he roams with his flocks from pasture to pasture and oasis to oasis, where life knows much hardship but escapes the grind of drudgery, where the watching of grazing herd gives him leisure for contemplation, and the wide-ranging life a big horizon, his ideas take on a certain gigantic simplicity; religion becomes monotheism, God becomes one, unrivalled like the sand of the desert and the grass of the steppe, stretching on and on without break or change. Chewing over and over the cud of his simple belief as the one food of his unfed mind, his faith becomes fanaticism; his big spacial ideas, born of that ceaseless regular wandering, outgrow the land that bred them and bear their legitimate fruit in wide imperial conquests.

Man can no more be scientifically studied apart from the ground which he tills, or the lands over which he travels, or the seas over which he trades, than polar bear or desert cactus can be understood apart from its habitat. Man's relations to his environment are infinitely more numerous and complex than those of the most highly organized plant or animal. So complex are they that they constitute a legitimate and necessary object of special study. The investigation which they receive in anthropology, ethnology, sociology and history is piecemeal and partial, limited as to the race, cultural development, epoch, country or variety of geographic conditions taken into account. Hence all these sciences, together with history so far as history undertakes to explain the causes of events, fail to reach a satisfactory solution of their problems largely because the geographic factor which enters into them all has not been thoroughly analyzed. Man has been so noisy about the way he has "conquered Nature," and Nature has been so silent in her persistent influence over man, that the geographic factor in the equation of human development has been overlooked.

In every problem of history there are two main factors, variously stated as heredity and environment, man and his geographic conditions, the internal forces of race and the external forces of habitat. Now the geographic element in the long history of human develop-

ment has been operating strongly and operating persistently. Herein lies its importance. It is a stable force. It never sleeps. This natural environment, this physical basis of history, is for all intents and purposes immutable in comparison with the other factor in the problem—shifting, plastic, progressive, retrogressive man.

History tends to repeat itself largely owing to this steady, unchanging geographic element. If the ancient Roman consul in far-away Britain often assumed an independence of action and initiative unknown in the provincial governors of Gaul, and if centuries later Roman Catholicism in England maintained a similar independence towards the Holy See, both facts have their cause in the remoteness of Britain from the centre of political or ecclesiastical power in Rome. If the independence of the Roman consul in Britain was duplicated later by the attitude of the Thirteen Colonies towards England, and again within the young Republic by the headstrong self-reliance, impatient of government authority, which characterized the early Trans-Allegheny commonwealths in their aggressive Indian policy, and led them to make war and conclude treaties for the cession of land like sovereign states; and if this attitude of independence in the over-mountain men reappeared in a spirit of political defection looking towards secession from the Union and a new combination with their British neighbour on the Great Lakes or the Spanish beyond the Mississippi, these are all the identical effects of geographical remoteness made yet more remote by barriers of mountain and sea. This is the long reach which weakens the arm of authority, no matter what the race or country or epoch.

As with geographical remoteness, so it is with geographical proximity. The history of the Greek peninsula and the Greek people, because of their location at the threshold of the Orient, has contained a constantly recurring Asiatic element. This comes out most often as a note of warning; like the *motif* of Ortrud in the opera of "Lohengrin," it mingles ominously in every chorus of Hellenic enterprise or pæan of Hellenic victory, and finally swells into a national dirge at the Turkish conquest of the peninsula. It comes out in the legendary history of the Argonautic Expedition and the Trojan War; in the arrival of Phœnician Cadmus and Phrygian Pelops in Grecian lands; in the appearance of Tyrean ships on the coasts of the Peloponnesus, where they gather the purple-yielding murex and kidnap Greek women. It appears more conspicuously in the Asiatic sources of Greek culture; more dramatically in the Persian Wars, in the retreat of Xenophon's Ten Thousand, in Alexander's conquest of Asia, and Hellenic domination of Asiatic trade through Syria to

the Mediterranean. Again in the thirteenth century the lure of the Levantine trade led Venice and Genoa to appropriate certain islands and promontories of Greece as commercial bases nearer to Asia. In 1396 begins the absorption of Greece into the Asiatic empire of the Turks, the long dark eclipse of sunny Hellas, till it issues from the shadow in 1832 with the achievement of Greek independence.

If the factor is not one of geographical location, but a natural barrier, such as a mountain system or a desert, its effect is just as persistent. The upheaved mass of the Carpathians served to divide the westward moving tide of the Slavs into two streams, diverting one into the maritime plain of northern Germany and Poland, the other into the channel of the Danube valley which guided them to the Adriatic and the foot of the Alps. This same range checked the westward advance of the mounted Tartar hordes. The Alps long retarded Roman expansion into central Europe, just as they delayed and obstructed the southward advance of the northern barbarians. Only through the partial breaches in the wall known as passes did the Alps admit small, divided streams of the invaders, like the Cimbri and Teutons, who arrived, therefore, with weakened power and at intervals, so that the Roman forces had time to gather their strength between successive attacks, and thus prolonged the life of the declining empire. So in the Middle Ages, the Alpine barrier facilitated the resistance of Italy to the German emperors, trying to enforce their claim upon this ancient seat of the Holy Roman Empire.

It was by river-worn valleys leading to passes in the ridge that Etruscan trader, Roman legion, barbarian horde, and German army crossed the Alpine ranges. To-day well-made highways and railroads converge upon these valley paths and summit portals, and going is easier; but the Alps still collect their toll, now in added tons of coal consumed by engines and in higher freight rates, instead of the ancient imposts of physical exhaustion paid by pack animal and heavily accoutered soldier. Formerly these mountains barred the weak and timid; to-day they bar the poor, and forbid transit to all merchandise of large bulk and small value which can not pay the heavy transportation charges. Similarly, the wide barrier of the Rockies, prior to the opening of the first overland railroad, excluded all but strong-limbed and strong-hearted pioneers from the fertile valleys of California and Oregon, just as it excludes coal and iron even from the Colorado mines, and checks the free movement of labourers to the fields and factories of California, thereby tightening the grip of the labour unions upon Pacific coast industries.

As the surface of the earth presents obstacles, so it offers channels for the easy movement of humanity, grooves whose direction determines the destination of unknowing, unplanned migrations, and whose termini become, therefore, regions of historical importance. Along these nature-made highways history repeats itself. The maritime plain of Palestine has been an established route of commerce and war from the time of Sennacherib to Napoleon.* The Danube valley has admitted to central Europe a long list of barbarian invaders, covering the period from Attila the Hun to the Turkish besiegers of Vienna in 1683. The history of the Danube valley has been one of warring throngs, of shifting political frontiers, and unassimilated races; but as the river is a great natural highway, every neighbouring state wants to front upon it and strives to secure it as a boundary.

The movements of peoples constantly recur to these old grooves. The unmarked path of the voyageur's canoe, bringing out pelts from Lake Superior to the fur market at Montreal, is followed to-day by whaleback steamers with their cargoes of Manitoba wheat. To-day the Mohawk depression through the northern Appalachians diverts some of Canada's trade from the Great Lakes to the Hudson, just as in the seventeenth century it enabled the Dutch at New Amsterdam and later the English at Albany to tap the fur trade of Canada's frozen forests. Formerly a line of stream and portage, it carries now the Erie Canal and New York Central Railroad.† Similarly the narrow level belt of land extending from the mouth of the Hudson to the eastern elbow of the lower Delaware, defining the outer margin of the rough hill country of northern New Jersey and the inner margin of the smooth coastal plain, has been from savage days such a natural thoroughfare. Here ran the trail of the Lenni-Lenapi Indians; a little later, the old Dutch road between New Amsterdam and the Delaware trading-posts; yet later the King's Highway from New York to Philadelphia. In 1838 it became the route of the Delaware and Raritan Canal, and more recently of the Pennsylvania Railroad between New York and Philadelphia.‡

The early Aryans, in their gradual dispersion over northwestern India reached the Arabian Sea chiefly by a route running southward from the Indus-Ganges divide, between the eastern border of the Rajputana Desert and the western foot of the Aravalli Hills. The

* George Adam Smith, "Historical Geography of the Holy Land," pp. 149–157. New York, 1897.

† A. P. Brigham, "Geographic Influences in American History," Chap. I. Boston, 1903.

‡ R. H. Whitbeck, "Geographic Influences in the Development of New Jersey," *Journal of Geography*, Vol. V, No. 6. January, 1908.

streams flowing down from this range across the thirsty plains unite to form the Luni River, which draws a dead-line to the advance of the desert. Here a smooth and well-watered path brought the early Aryans of India to a fertile coast along the Gulf of Cambay.* In the palmy days of the Mongol Empire during the seventeenth century, and doubtless much earlier, it became an established trade route between the sea and the rich cities of the upper Ganges.† Recently it determined the line of the Rajputana Railroad from the Gulf of Cambay to Delhi.‡ Barygaza, the ancient seaboard terminus of this route, appears in Pliny's time as the most famous emporium of western India, the resort of Greek and Arab merchants.§ It reappears later in history with its name metamorphosed to Baroche or Broach, where in 1616 the British established a factory for trade,‖ but is finally superseded, under Portuguese and English rule, by nearby Surat. Thus natural conditions fix the channels in which the stream of humanity most easily moves, determine within certain limits the direction of its flow, the velocity and volume of its current. Every new flood tends to fit itself approximately into the old banks, seeks first these lines of least resistance, and only when it finds them blocked or pre-empted does it turn to more difficult paths.

Geographical environment, through the persistence of its influence, acquires peculiar significance; its effect is not restricted to a given historical event or epoch, but unless met by some strong counteracting force, tends to make itself felt under varying guise in all succeeding history. It is the permanent element in the shifting fate of races. Islands show certain fundamental points of agreement which can be distinguished in the economic, ethnic and historical development of England, Japan, Melanesian Fiji, Polynesian New Zealand, and pre-historic Crete. The great belt of deserts and steppes extending across the Old World gives us a vast territory of rare historical uniformity. From time immemorial they have borne and bred tribes of wandering herdsmen; they have sent out the invading hordes who, in successive waves of conquest, have overwhelmed the neighbouring river lowlands of Eurasia and Africa. They have given birth in turn to Scythians, Indo-Aryans, Avars, Huns, Saracens, Tartars and Turks, as to the Tuareg tribes of the Sahara, the Sudanese and Bantu folk of the African grasslands. But whether

* Hans Helmolt, "History of the World," Vol. II, p. 372. London and New York, 1902–1906.
† Jean Baptiste Tavernier. "Travels in India," 1641–1667. Vol. I, chap. V and map. London, 1889.
‡ Sir Thomas Holdich, "India," p. 305, London, 1905.
§ Bunbury, "History of Ancient Geography," Vol. II, pp. 464–465, 469, London.
‖ Imperial Gazetteer for India. Vol. III, p. 109, London, 1885.

these various peoples have been Negroes, Hamites, Semites, Indo-Europeans or Mongolians, they have always been pastoral nomads. The description given by Herodotus of the ancient Scythians is applicable in its main features to the Kirghis and Kalmuck who inhabit the Caspian plains to-day. The environment of this dry grassland operates now to produce the same mode of life and social organization as it did 2400 years ago; stamps the cavalry tribes of Cossacks as it did the mounted Huns, energizes its sons by its dry bracing air, toughens them by its harsh conditions of life, organizes them into a mobilized army, always moving with its pastoral commissariat. Then when population presses too hard upon the meager sources of subsistence, when a summer drought burns the pastures and dries up the water-holes, it sends them forth on a mission of conquest, to seek abundance in the better watered lands of their agricultural neighbours. Again and again the productive valleys of the Hoangho, Indus, Ganges, Tigris and Euphrates, Nile, Volga, Dnieper and Danube have been brought into subjection by the imperious nomads of arid Asia, just as the "hoe-people" of the Niger and upper Nile have so often been conquered by the herdsmen of the African grasslands. Thus, regardless of race or epoch—Hyksos or Kaffir—history tends to repeat itself in these rainless tracts, and involves the better watered districts along their borders when the vast tribal movements extend into these peripheral lands.

The more the comparative method is applied to the study of history—and this includes a comparison not only of different countries, but also of successive epochs in the same country—the more apparent becomes the influence of the soil in which humanity is rooted, the more permanent and necessary is that influence seen to be. Geography's claim to make scientific investigation of the physical conditions of historical events is then vindicated. "Which was there first, Geography or History?" asks Kant. And then comes his answer: "Geography lies at the basis of history." The two are inseparable. History takes for its field of investigation human events in various periods of time; anthropo-geography studies existence in various regions of terrestrial space. But all historical development takes place on the earth's surface, and therefore is more or less molded by its geographic setting. Geography, to reach accurate conclusions, must compare the operation of its factors in different historical periods and at different stages of cultural development. It, therefore, regards history in no small part as a succession of geographical factors embodied in events. Back of Massachusetts' passionate abolition movement, it sees the granitic soil and boulder-

strewn fields of New England; back of the South's long fight for the maintenance of slavery, it sees the rich plantations of tidewater Virginia and the teeming fertility of the Mississippi bottom lands. This is the significance of Herder's saying that "history is geography set into motion." What is to-day a fact of geography becomes to-morrow a factor of history. The two sciences cannot be held apart without doing violence to both, without dismembering what is a natural vital whole. All historical problems ought to be studied geographically and all geographic problems must be studied historically. Every map has its date. Those in the Statistical Atlas of the United States showing the distribution of population from 1790 to 1890 embody a mass of history as well as of geography. A map of France or the Russian Empire has a long historical perspective; and on the other hand, without that map no change of ethnic or political boundary, no modification in routes of communication, no system of frontier defences or of colonization, no scheme of territorial aggrandizement can be understood.

The study of physical environment as a factor in history was unfortunately brought into dispute by extravagant and ill-founded generalizations before it was made the object of investigation according to modern scientific methods. And even to-day principles advanced in the name of anthropo-geography are often superficial, inaccurate, based upon a body of data too limited as to space and time, or couched in terms of unqualified statement which inevitably exposes them to criticism or refutation. Investigators in this field, moreover, are prone to get a squint in their eye that makes them see one geographic factor to the exclusion of the rest; whereas it belongs to the very nature of physical environment to combine a whole group of influences, working all at the same time under the law of the resolution of forces. In this plexus of influences, some operate in one direction and some in another; now one loses its beneficent effect like a medicine long used or a garment outgrown; another waxes in power, reinforced by a new geographic factor which has been released from dormancy by the expansion of the known world, or the progress of invention and of human development.

These complex geographic influences cannot be analyzed and their strength estimated except from the standpoint of evolution. That is one reason these half-baked geographic principles rest heavy on our mental digestion. They have been formulated without reference to the all-important fact that the geographical relations of man, like his social and political organization, are subject to the law of

development. Just as the embryo state found in the primitive Saxon tribe has passed through many phases in attaining the political character of the present British Empire, so every stage in this maturing growth has been accompanied or even preceded by a steady evolution of the geographic relations of the English people.

Owing to the evolution of geographic relations, the physical environment favourable to one stage of development may be adverse to another, and *vice versa*. For instance, a small, isolated and protected habitat, like that of Egypt, Phœnicia, Crete and Greece, encourages the birth and precocious growth of civilization; but later it may cramp progress, and lend the stamp of arrested development to a people who were once the model for all their little world. Open and windswept Russia, lacking these small warm nurseries where Nature could cuddle her children, has bred upon its boundless plains a massive, untutored, homogeneous folk, fed upon the crumbs of culture that have fallen from the richer tables of Europe. But that item of area is a variable quantity in the equation. It changes its character at a higher stage of cultural development. Consequently, when the Muscovite people, instructed by the example of western Europe, shall have grown up intellectually, economically and politically to their big territory, its area will become a great national asset. Russia will come into its own, heir to a long-withheld inheritance. Many of its previous geographic disadvantages will vanish, like the diseases of childhood, while its massive size will dwarf many previous advantages of its European neighbours.

This evolution of geographic relations applies not only to the local environment, but also to the wider world relations of a people. Greeks and Syrians, English and Japanese, take a different rank among the nations of the earth to-day from that held by their ancestors 2,000 years ago, simply because the world relations of civilized peoples have been steadily expanding since those far-back days of Tyrian and Athenian supremacy. The period of maritime discoveries in the fifteenth and sixteenth centuries shifted the foci of the world relations of European states from enclosed seas to the rim of the Atlantic. Venice and Genoa gave way to Cadiz and Lagos, just as, sixteen centuries before, Corinth and Athens had yielded their ascendency to Rome and Ostia. The keen but circumscribed trade of the Baltic, which gave wealth and historical pre-eminence to Lübeck and the other Hanse Towns of northern Germany from the twelfth to the seventeenth century, lost its relative importance when the Atlantic became the maritime field of history. Maritime leadership passed westward from Lübeck and Stralsund to Amster-

dam and Bristol, as the historical horizon widened. England, prior to this sudden dislocation, lay on the outskirts of civilized Europe, a terminal land, not a focus. The peripheral location which retarded her early development became a source of power when she accumulated sufficient density of population for colonizing enterprises, and when maritime discovery opened a way to trans-oceanic lands.*

Meanwhile, local geographic advantages in the old basins remain the same, although they are dwarfed by the development of relatively greater advantages elsewhere. The broken coastline, limited area and favourable position of Greece make its people to-day a nation of seamen, and enable them to absorb by their considerable merchant fleet a great part of the trade of the eastern Mediterranean,† just as they did in the days of Pericles; but that youthful Aegean world which once constituted so large a part of the *oekumene,* has shrunken to a modest province, and its highways to local paths. The coast cities of northern Germany still maintain a large commerce in the Baltic, but no longer hold the pre-eminence of the old Hanse Towns. The glory of the Venetian Adriatic is gone; but that the sea has still a local significance is proven by the vast sums spent by Austria and Hungary on their hand-made harbours of Trieste and Fiume.‡ The analytical geographer, therefore, while studying a given combination of geographic forces, must be prepared for a momentous readjustment and a new interplay after any marked turning point in the economic, cultural, or world relations of a people.

Skepticism as to the effect of geographic conditions upon human development is apparently justifiable, owing to the multiplicity of the underlying causes and the difficulty of distinguishing between stronger and weaker factors on the one hand, as between permanent and temporary effects on the other. We see the result, but find it difficult to state the equation producing this result. But the important thing is to avoid seizing upon one or two conspicuous geographic elements in the problem and ignoring the rest. The physical environment of a people consists of all the natural conditions to which they have been subjected, not merely a part. Geography admits no single blanket theory. The slow historical development of the Russian folk has been due to many geographic causes—to excess of cold and deficiency of rain, an outskirt location on the

* G. G. Chisholm. "The Relativity of Geographic Advantages," *Scottish Geog. Mag.* Vol. XIII, No. 9, Sept. 1897.

† Hugh Robert Mill, "International Geography," p. 347, New York, 1902.

‡ Joseph Partsch, "Central Europe," pp. 228–230. London, 1903.

Asiatic border of Europe exposed to the attacks of nomadic hordes, a meager and, for the most part, ice-bound coast which was slowly acquired, an undiversified surface, a lack of segregated regions where an infant civilization might be cradled, and a vast area of unfenced plains wherein the national energies spread out thin and dissipated themselves. The superior Baltic and Black Sea coasts, the fertility of its Ukraine soil, and location next to wide-awake Germany along the western frontier have helped to accelerate progress, but the slow-moving body carried too heavy a drag.

The law of the resolutions of forces applies in geography as in the movement of planets. Failure to recognize this fact often enables superficial critics of anthropo-geography to make a brave show of argument. The analysis of these interacting forces and of their various combinations requires careful investigation. Let us consider the interplay of the forces of land and sea apparent in every country with a maritime location. In some cases a small, infertile, niggardly country conspires with a beckoning sea to drive its sons out upon the deep; in others a wide territory with a generous soil keeps its well-fed children at home and silences the call of the sea. In ancient Phœnicia and Greece, in Norway, Finland, New England, in savage Chile and Tierra del Fuego, and the Indian coast district of British Columbia and southern Alaska, a long, broken shoreline, numerous harbours, outlying islands, abundant timber for the construction of ships, difficult communication by land, all tempted the inhabitants to a sea-faring life. While the sea drew, the land drove in the same direction. There a hilly or mountainous interior putting obstacles in the way of landward expansion, sterile slopes, a paucity of level, arable land, an excessive or deficient rainfall withholding from agriculture the rewards of tillage—some or all of these factors combined to compel the inhabitants to seek on the sea the livelihood denied by the land. Here both forces worked in the same direction.

In England conditions were much the same, and from the sixteenth century produced there a predominant maritime development which was due not solely to a long indented coastline and an exceptional location for participating in European and American trade. Its limited island area, its large extent of rugged hills and chalky soil fit only for pasturage, and the lack of a really generous natural endowment,* made it slow to answer the demands of a growing population, till the industrial development of the nineteenth century exploited its mineral wealth. So the English turned to the sea—

* H. J. Mackinder, "Britain and the British Seas," pp. 317–323. London, 1904.

to fish, to trade, to colonize. Holland's conditions made for the same development. She united advantages of coastline and position with a small infertile territory, consisting chiefly of water-soaked grazing lands. When at the zenith of her maritime development, a native authority estimated that the soil of Holland could not support more than one-eighth of her inhabitants. The meager products of the land had to be eked out by the harvest of the sea. Fish assumed an important place in the diet of the Dutch, and when a process of curing it was discovered, laid the foundation of Holland's export trade. A geographical location central to the Baltic and North Sea countries, and accessible to France and Portugal, combined with a position at the mouth of the great German rivers made it absorb the carrying trade of northern Europe.* Land and sea coöperated in its maritime development.

Often the forces of land and sea are directly opposed. If a country's geographic conditions are favourable to agriculture and offer room for growth of population, the land forces prevail, because man is primarily a terrestrial animal. Such a country illustrates what Chisholm, with Attic nicety of speech, calls "the influence of bread-power on history,"† as opposed to Mahan's sea-power. France, like England, had a long coastline, abundant harbours, and an excellent location for maritime supremacy and colonial expansion; but her larger area and greater amount of fertile soil put off the hour of a redundant population such as England suffered from even in Henry VIII's time. Moreover, in consequence of steady continental expansion from the twelfth to the eighteenth century and a political unification which made its area more effective for the support of the people, the French of Richelieu's time, except those from certain districts, took to the sea, not by national impulse as did the English and Dutch, but rather under the spur of government initiative. They therefore achieved far less in maritime trade and colonization.‡ In ancient Palestine, a long stretch of coast, poorly equipped with harbours, but accessible to the rich Mediterranean trade, failed to offset the attraction of the gardens and orchards of the Jordan valley and the pastures of the Judean hills, or to overcome the land-born predilections and aptitudes of the desert-bred Jews. Similarly, the river-fringed peninsulas of Virginia and Maryland, opening wide their doors to the incoming sea, were powerless, nevertheless, to draw the settlers away from the riotous productiveness of the

* Capt. A. T. Mahan, "Influence of Sea Power upon History," pp. 36–38. Boston, 1902.
† G. G. Chisholm, "Economic Geography," *Scottish Geog. Mag.*, March, 1908.
‡ Capt. A. T. Mahan, "Influence of Sea Power upon History," pp. 37–38. Boston, 1902.

wide tidewater plains. Here again the geographic force of the land outweighed that of the sea and became the dominant factor in directing the activities of the inhabitants.

The two antagonistic geographic forces may be both of the land, one born of a country's topography, the other of its location. Switzerland's history has for centuries shown the conflict of two political policies, one a policy of cantonal and communal independence, which has sprung from the division of that mountainous country into segregated districts, and the other one of political centralization, dictated by the necessity for co-operation to meet the dangers of Switzerland's central location mid a circle of larger and stronger neighbours. Local geographic conditions within the Swiss territory fixed the national ideal as a league of "sovereign cantons," to use the term of their constitution, enjoying a maximum of individual rights and privileges, and tolerating a minimum of interference from the central authority. Here was physical dismemberment coupled with mutual political repulsion. But a location at the meeting place of French, German, Austrian and Italian frontiers laid upon them the distasteful necessity of union within to withstand the aggressions crowding on them from without. Hence the growth of the Swiss constitution since 1798 has meant a fight of the Confederation against the canton in behalf of general rights, expanding the functions of the central government, contracting those of canton and commune.*

The geographic factors in history appear now as conspicuous direct effects of environment, such as the forest warfare of the American Indian or the irrigation works of the Pueblo tribes, now as a group of indirect effects, operating through the economic, social and political activities of a people. These remoter secondary results are often of supreme importance; they are the ones which give the final stamp to the national temperament and character, and yet in them the causal connection between environment and development is far from obvious. They have, therefore, presented pitfalls to the precipitate theorizer. He has either interpreted them as the direct effect of some geographic cause from which they were wholly divorced and thus arrived at conclusions which further investigation failed to sustain; or seeing no direct and obvious connection, he has denied the possibility of a generalization.

Montesquieu ascribes the immutability of religion, manners, customs and laws in India and other oriental countries to their warm

* Boyd Winchester, "The Swiss Republic," pp. 123, 124, 145-147. Philadelphia, 1891.

climate.* Buckle attributes a highly wrought imagination and gross superstition to all people, like those of India, living in the presence of great mountains and vast plains, knowing Nature only in its overpowering aspects, which excite the fancy and paralyze reason. He finds, on the other hand, an early predominance of reason in the inhabitants of a country like ancient Greece, where natural features are on a smaller scale, more comprehensible, nearer the measure of man himself.† The scientific geographer, grown suspicious of the omnipotence of climate and cautious of predicating immediate psychological effects which are easy to assert but difficult to prove, approaches the problem more indirectly and reaches a different solution. He finds that geographic conditions have condemned India to isolation. On the land side, a great sweep of high mountains has restricted intercourse with the interior; on the sea side, the deltaic swamps of the Indus and Ganges Rivers and an unbroken shoreline, backed by mountains on the west of the peninsula and by coastal marshes and lagoons on the east, have combined to reduce its accessibility from the ocean. The effect of such isolation is ignorance, superstition, and the early crystallization of thought and customs. Ignorance involves the lack of material for comparison, hence a restriction of the higher reasoning processes, and an unscientific attitude of mind which gives imagination free play. In contrast, the accessibility of Greece and its focal location in the ancient world made it an intellectual clearing-house for the eastern Mediterranean. The general information gathered there afforded material for wide comparison. It fed the brilliant reason of the Athenian philosopher and the trained imagination which produced the masterpieces of Greek art and literature.

Heinrich von Treitschke, in his recent "Politik," imitates the direct inference of Buckle when he ascribes the absence of artistic and poetic development in Switzerland and the Alpine lands to the overwhelming aspect of nature there, its majestic sublimity which paralyzes the mind.‡ He reinforces his position by the fact that, by contrast, the lower mountains and hill country of Swabia, Franconia and Thuringia, where nature is gentler, stimulating, appealing, and not overpowering, have produced many poets and artists. The facts are incontestable. They reappear in France in the geographical distribution of the awards made by the Paris *Salon* of 1896. Judging by these awards, the rough highlands of Savoy, Alpine Province,

* Montesquieu, "Spirit of the Laws." Book XIV, chap. IV.

† Henry Buckle, "History of Civilization in England," Vol. I, pp. 86–106.

‡ Heinrich von Treitschke, "Politik," vol. I, p. 225, Leipzig, 1897. This whole chapter on *Land und Leute* is suggestive.

the massive eastern Pyrenees, and the Auvergne plateau, together with the barren peninsula of Brittany, are singularly lacking in artistic instinct, while art flourishes in all the river lowlands of France. Moreover, Frenchmen of letters, by the distribution of their birthplaces, are essentially products of fluvial valleys, and plains, rarely of upland and mountain.*

This contrast has been ascribed to a fundamental ethnic distinction between the Teutonic population of the lowlands and the Alpine or Celtic stock which survives in the protected isolation of highland and peninsula, thus making talent an attribute of race. But the Po valley of northern Italy, whose population contains a strong infusion of this supposedly stultifying Alpine blood, and the neighbouring lowlands and hill country of Tuscany show an enormous preponderance of intellectual and artistic power over the highlands of the peninsula.† Hence the same contrast appears among different races under like geographic conditions. Moreover, in France, other social phenomena, such as suicide, divorce, decreasing birth-rate, and radicalism in politics, show this same startling parallelism of geographic distribution.‡ and these cannot be attributed to the stimulating or depressing effect of natural scenery on the human mind.

Mountain regions discourage the budding of genius because they are areas of isolation, confinement, remote from the great currents of men and ideas that move along the river valleys. They are regions of much labour and little leisure, of poverty to-day and anxiety for the morrow, of toil-cramped hands and toil-dulled brains. In the fertile alluvial plains are wealth, leisure, contact with many minds, large urban centers where commodities and ideas are exchanged. The two contrasted environments produce directly certain economic and social results, which, in turn, become the causes of secondary intellectual and artistic effects. The low mountains of central Germany which von Treitschke cites as homes of poets and artists, owing to abundant and varied mineral wealth, are the seats of active industries and dense populations,§ while their low reliefs present no serious obstacle to the numerous highways across them. They, therefore, afford all conditions for culture.

Let us take a different example. The rapid modification in physical and mental constitution of the English transplanted to North America, South Africa, Australia and New Zealand has been

* W. L. Ripley, "Races of Europe," pp. 524–525. New York, 1899.

† *Ibid.*, 526.

‡ *Ibid.*, 517–520, 533–736.

§ Joseph Partsch, "Central Europe," pp. 256–257, 268–271. London, 1903.

the result of several geographic causes working through the economic and social media; but it has been ascribed by Darwin and others to the effect of climate. The prevailing energy and initiative of colonists have been explained by the stimulating atmosphere of their new homes. Even Natal has not escaped this soft impeachment. But the enterprise of colonials has cropped out under almost every condition of heat and cold, aridity and humidity, of a habitat at sea-level and on high plateau. This blanket theory of climate cannot, therefore, cover the case. Careful analysis supersedes it by a whole group of geographic factors working directly and indirectly. The first of these was the dividing ocean, which prior to the introduction of cheap ocean transportation and bustling steerage agents, made a basis of artificial selection. Then it was the man of abundant energy who, cramped by the narrow environment of a Norwegian farm or Irish bog, came over to America to take up a quarter-section of prairie land or rise to the eminence of Boston police sergeant. The Scotch immigrants in America who fought in the Civil War were nearly two inches taller than the average in the home country.* But the ocean barrier culled superior qualities of mind and character also—independence of political and religious conviction, and the courage of those convictions, whether found in royalist or Puritan, Huguenot or English Catholic.

Such colonists in a remote country were necessarily few and could not be readily reinforced from home. Their new and isolated geographical environment favoured variation. Heredity passed on the characteristics of a small, highly selected group. The race was kept pure from intermixture with the aborigines of the country, owing to the social and cultural abyss which separated them, and to the steady withdrawal of the natives before the advance of the whites. The homogeneity of island peoples seems to indicate that individual variations are in time communicated by heredity to a whole population under conditions of isolation; and in this way modifications due to artificial selection and a changed environment become widely spread.

Nor is this all. The modified type soon becomes established, because the abundance of land at the disposal of the colonists and the consequent better conditions of living encourage a rapid increase of population. A second geographic factor of mere area here begins to operate. Ease in gaining subsistence, the greater independence of the individual and the family, emancipation from carking care, the hopeful attitude of mind engendered by the consciousness of an

* W. L. Ripley, "Races of Europe," p. 89. New York, 1899.

almost unlimited opportunity and capacity for expansion, the expectation of large returns upon labour, and, finally, the profound influence of this hopefulness upon the national character, all combined, produce a social rejuvenation of the race. New conditions present new problems which call for prompt and original solution, make a demand upon the ingenuity and resourcefulness of the individual, and therefore work to the same end as his previous removal from the paralyzing effect of custom in the old home country. Activity is youth and sluggishness or paralysis is age. Hence the energy, initiative, adaptibility, and receptivity to new ideas—all youthful qualities—which characterize the Anglo-Saxon American as well as the English Africander, can be traced back to the stimulating influences, not of a bracing or variable climate, but of the abundant opportunities offered by a great, rich, unexploited country. Variation under new natural conditions, when safe-guarded by isolation, tends to produce modification of the colonial type; this is the direct effect of a changed environment. But the new economic and social activities of a transplanted people become the vehicle of a mass of indirect geographic influences which contribute most to the differentiation of the national character.

The tendency to overlook such links between conspicuous effects and their remote, less evident geographic causes has been common in geographic investigation. This direct rather than indirect approach to the heart of the problem has led to false inferences or to the assumption that reliable conclusions were impossible. Environment influences the higher, mental life of a people chiefly through the medium of their economic and social life; hence its ultimate effects should be traced through the latter back to the underlying cause. But rarely is this done. Even so astute a geographer as Strabo, though he recognizes the influence of geographic isolation in differentiating dialects and customs in Greece,* ascribes some national characteristic to the nature of the country, especially to its climate, and the others to education and institutions. He thinks that the nature of their respective lands had nothing to do with making the Athenians cultured, the Spartans and Thebans ignorant; that the predilection for natural philosophy in Babylonia and Egpyt was not a result of environment but of the institutions and education of those countries.† But here arise the questions, how far custom and education in their turn depend upon environment; to what degree natural conditions, molding economic and political development, may through them fundamentally affect social customs,

* Strabo, Book VII, chap I, p. 2.

† Strabo, Book II, chap. III, p. 7.

education, culture, and the dominant intellectual aptitudes of a people. It is not difficult to see, back of the astronomy and mathematics and hydraulics of Egypt, the far off sweep of the rain-laden monsoons against the mountains of Abyssinia and the creeping of the tawny Nile flood over that river-born oasis.

Plutarch states in his "Solon" that after the rebellion of Kylon in 612 B.C. the Athenian people were divided into as many political factions as there were physical types of country in Attica. The mountaineers, who were the poorest party, wanted something like a democracy; the people of the plains, comprising the greatest number of rich families, were clamourous for an oligarchy; the coast population of the south, intermediate both in social position and wealth, wanted something between the two. The same three-fold division appeared again in 564 B.C. on the usurpation of Peisistratus.* Here the connection between geographic condition and political opinion is clear enough, though the links are agriculture and commerce. New England's opposition to the War of 1812, culminating in the threat of secession of the Hartford Convention, can be traced back through the active maritime trade to the broken coastline and unproductive soil of that glaciated country.

In all democratic or representative forms of government permitting free expression of popular opinion, history shows that division into political parties tends to follow geographical lines of cleavage. In our own Civil War the dividing line between North and South did not always run east and west. The mountain area of the Southern Appalachians supported the Union and drove a wedge of disaffection into the heart of the South. Mountainous West Virginia was politically opposed to the tidewater plains of old Virginia, because slave labour did not pay on the barren "upright" farms of the Cumberland Plateau; whereas, it was remunerative on the wide fertile plantations of the coastal lowland. The ethics of the question were obscured where conditions of soil and topography made the institution profitable. In the mountains, as also in New England, a law of diminishing financial returns had for its corollary a law of increasing moral insight. In this case, geographic conditions worked through the medium of direct economic effects to more important political and ethical results.

The roots of geographic influence often run far underground before coming to the surface, to sprout into some flowering growth; and to trace this back to its parent stem is the necessary but not easy task of the geographer.

* Plutarch, "Solon," pp. 13, 29, 154.

XUM

HONORARY AND CORRESPONDING MEMBERS AND FELLOWS

OF THE

AMERICAN GEOGRAPHICAL SOCIETY.

JULY 1, 1909.

HONORARY MEMBERS.

DAVIS, Wm. Morris, Harvard University.
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MARKHAM, Sir Clements R., K.C.B. London.
MENDENHALL, Thomas C., Ph.D.
MURRAY, Sir John, K.C.B., Edinburgh.
NANSEN, Dr. Fridtjof, Christiania.
NARES, Vice-Admiral Sir George S., R.N., K.C.B.
PEARY, Commander Robert E., U.S.N.
PENCK, Prof. Dr. F. C. Albrecht.

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CHAILLÉ-LONG, Col. Ch.
CHAIX, Prof. Emile, Geneva, Switzerland.
CORA, Guido, Rome.
DAVIDSON, Prof. George, San Francisco.
GANNETT, Henry, Washington.
GARDNER, Prof. James T., New York.
GILLIODTS, VAN SEVEREN, L., LL.D., Bruges.
GOBAT, Dr. A., Nat. Councillor, Berne.
GRIGORIEV, Alex. V., Imp. Russian Geographical Society, St. Petersburg.
HUNT, William H., Tamatave, Madagascar.
JACKSON, Frederick George, Capt., London.
LECLERCQ, Jules, Brussels.
LUCE, Rear-Admiral S. B., U.S.N.
LUMHOLTZ, Carl, M.A., New York.
PEET, Rev. Stephen D., Salem, Mass.
PERALTA, Manuel M. de, Paris.
PROUT, Col. Henry G.
PUMPELLY, Prof. Raphael.
SEMENOV, Peter P., Vice-Prest. Imp. Russ. Geog. Soc., St. Petersburg.
TACHE, E. E., Asst. Commissioner of Crown Lands, Quebec.
VIGNAUD, Henry, Paris.
VINCENT, Frank, New York.
VON DEN STEINEN, Prof. Dr. Karl, Berlin.
WILLIAMS, Horace E., São Paulo, Brazil.
WYSE, Lieut.-Com. Lucien N. B.

FELLOWS.

Names of Life Fellows are printed in italics.

Date of Election.

1885 *Abbot, Edwin H.*
1908 Aberle, Edward.
1902 Acheson, Edward G.
1902 Ackerman, Ernest R.
1892 Adams, Cyrus C.
1903 *Adams, Edward D.*
1891 Agar, John G.
1906 Agassiz, G. R.
1904 Agens, Frederick G.
1885 Agnew, Andrew G.
1909 *Agnew, Cornelius Rea.*
1909 *Agnew, George B.*
1898 *Aldrich, Mrs. James Herman.*
1898 Alexander, Harry, E.E., M.E.
1888 Alexander, J. F.
1898 Allen, W. F.
1903 Allen, William Porter.
1898 *Allin, F. Brevoort.*
1904 Amend, Robert F.
1883 Ames, Adelbert.
1897 Anderson, A. J. C.
1890 *Anderson, Arthur A.*
1890 Andreini, J. M.
1906 Andrews, Wm. H.
1887 Andrews, Wm. L.
1905 *Anthony, S. Reed.*
1898 Appleton, Herbert.
1887 *Archbold, John D.*
1904 Archer, George A.
1904 Arend, Francis J.
1891 Arms, George.
1898 Armstrong, Charles P.
1891 Armstrong, Collin.
1906 *Armstrong, Samuel T., M.D.*
1895 Arnot, M. H.
1890 Astor, John J.
1874 *Astor, William W.*
1891 Atkinson, John B.
1883 *Atterbury, J. T.*
1903 Atwater, James C.
1899 *Aycrigg, B. Arthur.*
1897 Ayer, James C., M.D.

Date of Election.

1886 Backus, J. Bayard.
1882 *Bacon, Francis M.*
1897 Bacon, Selden.
1904 Bailey, Edward G.
1904 Baker, A. G.
1902 *Baker, B. N.*
1899 Baker, O. M.
1900 *Balch, Edwin S.*
1904 Balch, Glen E.
1881 *Baldwin, Edwin.*
1874 *Baldwin, Townsend B.*
1899 Baldwin, William D.
1888 *Bancroft, H. H.*
1905 Banks, A. Bleecker.
1868 *Banks, David.*
1882 *Barger, Samuel F.*
1889 Baring, Thomas.
1906 Barkley, Charles B.
1890 Barnard, John F.
1898 Barnes, Chas. J.
1874 Barnes, John S.
1905 *Barney, Edgar S.*
1882 Barney, N. C.
1906 Barrett, John.
1904 Barringer, Daniel Moreau.
1888 Barstow, J. Whitney, M.D.
1899 *Bartow, Charles S.*
1905 Bastin, J. E.
1898 Batchelor, Charles.
1906 Battelle, J. G.
1906 Bayliss, John Y.
1895 Beal, William R.
1904 Beaman, George Herbert.
1904 Beaman, Mrs. Charles C
1908 Beck, Fanning C. T.
1886 Beddall, Edward F.
1875 Beekman, Gerard.
1888 Beers, M. H.
1874 Belding, Milo M., Sr.
1897 Belding, Milo M., Jr.
1891 Belin, Henry, Jr.
1900 Bell, Alexander Graham.

Date of Election.

1900 *Bell, Betrand F.*
1897 Bell, Dr. Ralcy H.
1883 Bell, Capt. William R.
1904 Bellows, Horace M., M.D.
1905 *Belmont, Perry.*
1890 Benedict, James H.
1907 Bennett, Charles Gibson.
1903 *Bennett, Frederick W., C.E.*
1868 Bennett, James Gordon.
1906 Bennett, John H.
1906 Berner, Charles E.
1891 Bernheim, Gustav.
1908 Bernheimer, Adolph L.
1903 *Bernheimer, Charles L.*
1890 Bertschmann, J.
1886 Berwind, Edward J.
1875 Beste, Henry.
1869 Bickmore, Prof. A. S.
1874 Bien, Julius.
1889 *Bigelow, Poultney.*
1909 Bigelow, Dr. William Sturgis.
1887 *Biglow, Lucius H.*
1906 *Billings, Richard.*
1893 Birdsall, Mrs. W. R.
1905 Bishop, Heber R.
1905 Bissell, Clinton T.
1904 Blackmore, Henry Spencer.
1905 Blaine, William T.
1906 Blair, C. Ledyard.
1898 Blake, Theodore A.
1878 *Bliss, Cornelius N.*
1901 Bliss, William H.
1891 Bogue, Virgil G.
1886 Bond, Frank S.
1905 Bond, Stephen N.
1905 Bonilla, Luis Enrique.
1884 *Bonner, G. T.*
1908 Boocock, Murray.
1904 *Bookman, Samuel, Ph.D.*
1899 Booraem, John V. V.
1900 Bormay, W. J.
1886 Bouvier, M. C.
1902 *Bowditch, Charles P.*
1904 Bowditch, Ernest W.
1900 *Bowdoin, George S.*
1904 *Bowdoin, Temple.*
1886 Bowers, John M.
1883 *Bowne, Walter.*
1890 *Brackenridge, George W.*

Date of Election.

1904 Bradford, Sidney.
1904 *Bradley, Arthur C.*
1895 Bradley, Edson.
1904 Bragaw, E. T.
1897 *Brainard, Lt.-Col. David L.,* U.S.A.
1890 Brewster, C. O.
1904 Brewster, George S.
1902 *Brewster, Robert S.*
1909 Brice, W. Kirkpatrick.
1886 Bridgman, E. C.
1900 Bridgman, Herbert L.
1905 Briscoe, Willis A.
1903 Brizse, Charles N.
1889 *Bromberg, Frederick G.*
1890 Brooker, Chas. F.
1904 Brooks, Alfred H.
1906 Brooks, John F.
1886 *Brown, Addison.*
1904 Brown, Rev. Clement.
1905 Brown, Davenport.
1903 Brown, Col. F. Q.
1878 Brown, J. Romaine.
1878 Brown, Rev. Philip A. H.
1887 *Brown, Robert I.*
1904 *Brown, William L.*
1875 Brownell, Silas B.
1874 *Brownson, Rear Adm. Willard H.,* U.S.N.
1901 *Bruce-Brown, William*
1904 Bruggerhof, F. W.
1901 Bruguière, Louis Sather.
1908 Bryce, Carroll.
1902 *Buchanan, James Isaac.*
1905 Buel, John L., M.D.
1900 Bulkley, Justice L.
1903 *Bunker, George R.*
1908 Burden, James A.
1902 *Burrage, Albert C.*
1902 *Burrage, Albert C., Jr.*
1902 *Burrage, Francis H.*
1902 *Burrage, Russell.*
1903 Burton, Prof. A. E.
1905 Bushnell, H. D.
1906 Butler, Chas. S.
1908 Butler, Howard Crosby.
1895 Butler, Joseph G., Jr.
1905 Butler, M. J., LL.B., C.E.
1907 Buzzacott, Francis F.

Date of Election.

1901 Cabell, Walter Coles.
1903 Caesar, Henry A.
1897 Cameron, W. L.
1908 Campbell, M. M., C.E.
1888 Canda, Charles J.
1887 Cannon, H. W.
1908 *Cannon, Henry Brevoort.*
1884 Carey, Henry T.
1907 Carey, Henry W.
1904 *Carnegie, Andrew.*
1901 *Carnegie, George L.*
1904 Carnegie, Thomas Morris.
1905 Carpenter, Franklin R., Ph.D.
1889 *Carter, John J.*
1897 Cassard, William J.
1906 Chadbourne, Wm. M.
1905 Chaloner, John Armstrong.
1897 Chamberlain, Rev. John.
1899 Chambers, Arthur D.
1897 Chambers, Frank R.
1906 Champ, Wm. S.
1906 Champollion, André.
1904 Chancellor, William E.
1890 Chanler, William Astor.
1905 Channing, J. Parke.
1897 *Chapin, Chester W.*
1883 *Chapman, Henry E.*
1888 Chase, George.
1904 Chatfield-Taylor, H. C.
1886 *Chauncey, Elihu.*
1906 Chew, Beverly.
1899 Chisholm, Hugh J.
1888 Chisolm, George E.
1906 Choate, Joseph H.
1874 *Church, Col. George Earl.*
1897 Church, George H.
1884 *Claflin, John.*
1891 Clapp, George H.
1905 Clark, Alzamore H.
1908 Clark, Charles A.
1905 Clark, Frank E.
1887 Clark, Jefferson.
1901 Clark, W. A.
1886 Clarke, C. C.
1882 *Clarkson, Banyer.*
1889 Clausen, George C.
1904 Cleland, Frank Benedict.
1907 Cleland, Herdman F.
1883 Clews, Henry.

Date of Election.

1883 Clyde, William P.
1905 Cobb, Sanford E.
1890 Cockcroft, Miss Mary T.
1897 Coffin, C. A.
1886 Coffin, Edmund.
1891 Cogswell, W. B.
1901 Cole, George Watson.
1886 *Colvin, Verplanck.*
1897 Combe, Mrs. William.
1892 Comer, John H.
1897 *Comstock, Frederick H.*
1889 Comstock, George Carlton.
1899 Condon, Thomas G.
1886 Conger, Clarence R.
1884 *Connor, W. E.*
1898 Cook, Eugene B.
1894 Cook, Dr. Frederick A.
1893 Coolidge, J. Randolph.
1903 Cornell, Russell R.
1902 Corning, Christopher R.
1897 Corning, G. M.
1905 Corning, Parker.
1886 Corthell, Elmer L.
1902 Cotton, Louis K.
1888 *Coutant, Charles Albert.*
1905 Coutant, Dr. Richard B.
1905 Cowee, Harvey D.
1906 Cowperthwait, Herbert M.
1899 *Cox, John Lyman.*
1902 *Coxe, Eckley B., Jr.*
1905 Craigie, A. Walpole.
1889 *Crane, Charles R.*
1906 Crane, George F.
1902 *Crane, Zenas.*
1887 *Cranitch, William I. A.*
1905 Crile, George, M.D.
1888 Crimmins, John D.
1874 Crosby, J. Schuyler.
1901 *Crozier, Capt. William.*
1906 Crozier, Wm. Armstrong.
1903 Cuntz, J. H.
1905 Curtis, George Carroll.
1906 Curtis, Thos. H.
1901 *Curtis, William Edmond.*
1884 Dalley, Henry.
1908 d'Altomonte, Baron A. Benedetti.
1906 Dalton, H. G.
1871 Daly, Joseph F.
1906 Damron, Wm. C.

Date of Election.

1905 Dana, Richard T.
1903 Dana, William B.
1895 Daniels, Charles H.
1892 Daniels, W. L.
1906 Darlington, Thos. M.D.
1875 Davies, Julien T.
1906 Davis, Charles Henry.
1906 Davis, Daniel A.
1884 Davis, Howland.
1877 *Davis, Joseph Beale.*
1905 *Dean, Mrs. Bashford.*
1880 *Deane, John H.*
1909 *de Coppet, Edward J.*
1901 de Coppet, Henry.
1880 *Deen, William M.*
1895 De Kalb, Courtenay.
1900 *Delafield, Albert.*
1874 Delafield, Maturin L.
1909 *Delano, Warren, Jr.*
1890 Dellinger, Charles F.
1906 Denholm, W. J.
1901 Dennis, Rev. James S.
1899 Dennis, John B.
1905 *de Peyster, Frederic Ashton.*
1880 *Dexter, Henry.*
1904 *Dey, Anthony.*
1903 Dick, Evans R.
1894 Dieterich, Charles F.
1897 Dillingham, Edwin R.
1905 Dimmick, J. Benjamin.
1905 Dimock, George E.
1904 Dix, Samuel M.
1881 *Docharty, Augustus T.*
1897 Dodge, Rev. D. Stuart.
1903 Dodge, Gen. Grenville M.
1896 Dodge, Richard E.
1893 Dodson, Robert Bowman.
1875 Dommerich, L. F.
1889 *Donald, Peter.*
1899 Doremus, Robert P.
1897 Doughty, Mrs. Alla.
1884 *Douglas, James.*
1903 Douglass, R. D.
1905 *Dowling, Robt. E.*
1888 *Drexel, Mrs Joseph W.*
1880 Du Bois, Frederick N.
1874 *Du Bois, William A.*
1898 Dunham, Edward K., M.D.
1897 Dunnell, William N., D.D.

Date of Election.

1905 Dunning, Clement S.
1906 Du Pont, Alexis I.
1889 Du Pont, Col. H. A.
1909 du Pont, P. S.
1901 *Durand, John S.*
1889 Durkee, Eugene W.
1894 Duvall, William C.
1889 Dwight, Jonathan, Jr., M.D.
1909 Dyer, Frank L.
1886 *Easton, Robert T. B.*
1905 Eaton, Charles Edwin.
1902 Eberstadt, Edward F.
1904 Eccles, Robert G., M.D.
1880 Eckert, Gen. Thomas T.
1905 *Eckert, Thomas T., Jr.*
1906 Eddy, Spencer.
1904 Edwards, Arthur M., M.D.
1882 Edwards, J. Pierrepont.
1887 Egleston, Melville.
1905 Eickemeyer, Carl.
1897 Eimer, August.
1901 *Eldert, Cornelius.*
1901 *Eldridge, Lewis A.*
1887 Elkins, S. B.
1879 *Elliott, Samuel.*
1886 Ellis, George W.
1875 Ellis, John W.
1882 *Ellis, Wilbur Dixon.*
1903 Ellis, William H.
1882 *Emerson, John W.*
1909 Emmet, C. Temple.
1904 Emmons, Arthur B.
1903 Endicott, William C.
1883 Eno, Amos F.
1906 Entz, George Gilbert.
1903 Eskesen, Eckhardt V.
1906 Estabrook, A. F.
1891 Eustis, W. E. C.
1909 *Evarts, Allen W.*
1906 Evers, Cecil C.
1905 Fahs, Charles H.
1882 Fairbanks, Leland.
1890 Fairchild, Chas. S.
1892 Fairchild, Samuel W.
1902 Fairleigh, David W.
1875 Fargo, James C.
1905 *Farish, John B.*
1909 Farley, Most Rev. John M.
1906 Farnham, Paulding.

Date of Election.

1901 *Farnsworth, William.*
1874 Farragut, Loyall.
1903 Faulkner, Charles J.
1890 *Fearing, Daniel B.*
1909 *Fearing, George R.*
1898 Fearons, Geo. H.
1898 *Ferguson, Henry.*
1888 *Ferguson, Walton.*
1906 Ferry, Mansfield.
1904 Fish, Charles Henry.
1908 Fisk, Arthur Lyman, M.D.
1902 Fisk, Pliny.
1886 *Flagler, H. M.*
1907 Fleischmann, Max C.
1889 Flint, Chas. R.
1901 *Flower, Frederick S.*
1906 Floyd-Jones, G. Stanton.
1875 Folsom, George W.
1875 *Ford, James B.*
1909 Fortescue, Granville R.
1905 Foster, Frederic deP.
1901 Fowler, Jonathan Odell, Jr.
1906 *Fowler, Thos. Powell.*
1874 *Fox, Austen G.*
1884 Frazer, Alfred.
1873 Freedman, John J.
1889 Freeland, Theodore H.
1894 Frick, John.
1902 Frissell, A. S.
1904 Fritz, Horace H.
1906 Frye, Jed.
1875 Fuller, Charles D.
1903 *Gaff, Thomas T.*
1889 *Gage, E. B.*
1905 Gaines, David H.
1886 Gallatin, Frederic.
1904 *Gammell, William.*
1904 Garrett, Robert.
1907 Gartland, George E.
1897 Garver, John A.
1903 *Gates, Isaac E.*
1891 Gay, Edward.
1879 Gay, Joseph E.
1905 Geer, Robert C.
1906 Geil, Wm. Edgar, Litt.D., LL.D.
1905 Gennert, Miss Helen L.
1868 *Gerry, Elbridge T.*
1903 Gibney, John R.
1906 Gielow, Henry J.

Date of Election.

1901 *Gilbert, Clinton.*
1889 Gilbert, G. K.
1893 *Gilbert, J. H. Grenville.*
1903 Gilman, Theodore P.
1909 Goddard, Conrad G.
1909 *Goelet, Robert.*
1897 Golding, John Noble.
1905 Goldsborough, John Byron.
1904 *Goodhart, Philip J.*
1898 *Goodnow, Harold P.*
1900 Goodridge, F. G., M.D.
1898 Goodwin, Rev. Francis.
1886 *Goodwin, James J.*
1887 Gossler, Gustav H.
1887 Gould, George J.
1909 Gourlay, Lawrence.
1905 Granbery, Julien Hastings.
1899 Grant, F. E.
1906 Grant, Jesse R.
1905 Grant, Madison.
1904 *Graves, George Coe.*
1895 Greeff, Ernest F.
1906 Green, Francis C.
1901 Green, Pinckney F.
1883 *Greenough, John.*
1856 Greenwood, Isaac J.
1892 Greenwood, Langdon, Jr.
1909 Grinnell, George Bird.
1897 Gruber, Abraham.
1903 Guggenheim, Simon.
1904 *Gunther, Bernard G.*
1886 *Gunther, Franklin L.*
1891 Haas, Kalman.
1906 *Hadden, John A., Jr.*
1874 *Haines, John P.*
1906 Hall, Harry Alvan.
1909 Hamilton, Rev. Alexander.
1903 Hamilton, Edmond H.
1879 Hamilton, William Gaston.
1905 Hammond, John Henry.
1909 Hanna, Charles A.
1904 Hansmann, Carl A.
1888 Harbeck, Charles T.
1888 Hard, Anson W.
1905 Hardenbergh, William P.
1901 Hardie, Wainwright.
1900 Harding, Edward.
1900 Hardley, J. Wheeler.
1902 Hare, J. Knowles.

Date of Election.

1903 Harrison, Hugh H.
1906 Hart, Richard P.
1897 Hart, Walter T.
1905 Hartzell, J. Culver.
1903 Harvey, Miss Rebecca.
1904 *Haupt, Louis, M.D.*
1905 Havemeyer, H. O., Jr.
1859 *Havemeyer, John C.*
1902 *Havemeyer, William F.*
1894 Haven, J. Woodward.
1909 Hayes, S. W.
1889 Haynes, Henry W.
1891 Hazard, Frederick R.
1909 Hazeltine, Mayo W.
1898 *Hearn, Arthur H.*
1897 *Hearn, George A.*
1905 Heath, H. E., E.E.
1883 *Hebert, Henry B.*
1902 Hedge, Frederic H.
1903 Heimann, Julius.
1886 Henderson, Harold G.
1874 Hendricks, Edmund.
1901 Hentz, Henry.
1899 *Herbert, John W.*
1903 Herrmann, Nathan.
1900 Herzog, F. Benedict, Ph.D.
1904 *Hess, Selmar.*
1904 *Heurich, C.*
1903 *Hewitt, Peter Cooper.*
1900 Hewlett, Walter Jones.
1901 Heydt, Herman A.
1906 Hickey, Jas. H.
1906 Higginson, Adm. Francis J., U.S.N., Retired.
1882 *Higginson, James J.*
1909 Higginson, James J., Jr.
1894 Hildreth, J. Homer.
1903 Hill, Charles B.
1890 Hill, James J.
1908 Hill, Samuel.
1886 Hillhouse, Thomas G.
1904 *Himmelwright, A. L. A.*
1887 Hinchman, Walter.
1881 Hinman, Russell.
1903 *Hirsch, Robert B.*
1904 Hitchcock, Mrs. Roswell D.
1889 *Hitchcock, Welcome G.*
1905 Hobby, C. M., M.D.
1904 Hoe, Alfred G.

Date of Election.

1886 Hoe, Robert.
1897 Hoe, William A.
1876 Hoes, William M.
1897 Hoey, Rev. Joseph L.
1901 Hoffman, Charles F., Jr.
1872 *Holbrook, Levi.*
1876 Holt, Henry.
1902 Holton, Henry D., M.D.
1901 *Hopkins, George B.*
1896 *Hotchkiss, Miss C. W.*
1909 Howard, Ora.
1898 Howell, M. D.
1905 Hoxie, William D.
1888 *Hoyt, Henry R.*
1906 Hubbard, Geo. D.
1906 *Hubbard, John.*
1898 *Hubbard, Robert J.*
1901 *Hubbard, Thomas H.*
1885 Hubbard, Walter.
1900 Hudnut, Richard A.
1897 Humphreys, Alexander C., M.E.
1893 *Huntington, Archer M.*
1909 *Huntington, Henry E.*
1893 Hurlbut, Theodore D.
1883 *Hurry, Edmund Abdy.*
1889 *Hurtt, Frank D.*
1890 Husted, Seymour L., Jr.
1897 Huyler, John S.
1901 Hyde, Augustus L.
1883 Hyde, E. Francis.
1901 *Hyde, James H.*
1905 Iddings, Andrew S.
1905 Iddings, Daniel W.
1899 Insull, Samuel.
1859 Ireland, John B.
1909 Irving, Courtlandt.
1890 Irving, Walter.
1874 Iselin, Adrian, Jr.
1887 *Isham, Charles.*
1881 *Ives, Brayton.*
1903 Jackson, A. Wendell.
1886 *Jackson, Rev. Samuel M.*
1897 Jackson, Theodore F.
1886 Jacobi, Abraham, M.D.
1891 Jaffray, Robert.
1894 James, Arthur Curtiss.
1890 James, Walter B., M.D.
1886 Janeway, Henry L.
1890 Janin, Henry.

Date of Election.

1891 Jaques, W. H.
1906 Jarves, Deming.
1903 Jarvie, James N.
1879 Jay, William.
1887 Jenkins, Augustus S.
1893 Jenkins, Michael.
1906 Jenkins, V. Clement.
1895 Jennings, Oliver G.
1902 Jessup, Henry W.
1880 *Jewett, George L.*
1906 *Jewett, W. K.*
1881 Johnson, Bradish.
1901 Johnson, Edward C.
1905 Johnson, Willis Fletcher, L.H.D.
1906 *Jones, Chas. Landon.*
1906 Jones, Dwight A.
1888 *Jones, Oliver L.*
1885 Juilliard, A. D.
1901 Julian-James, Mrs. Cassie.
1904 Jungmann, J., M.D.
1906 Junkin, J. de F., Jr.
1898 Kahn, O. H.
1881 *Kane, Grenville.*
1893 *Kane, Henry Brevoort.*
1895 *Kean, Hamilton F.*
1908 Keck, Thomas A.
1880 *Keene, James R.*
1888 Kellogg, Charles.
1897 Kemmerer, M. S.
1903 Kemp, James Furman.
1873 *Kennan, George.*
1901 Kennedy, E. G.
1901 *Kennedy, George G., M.D.*
1888 Kennedy, H. Van Rensselaer.
1881 *Kennedy, John S.*
1901 Kent, William.
1904 Kenyon, Robert N.
1906 Kenyon, Wm. Houston.
1885 *Keppler, Rudolph.*
1903 Kerr, John B.
1883 Kerr, Walter.
1909 Keyes, William F.
1886 *Kidder, Camillus G.*
1904 Kidder, Edward H.
1897 Kimball, Alfred R.
1883 King, D. H., Jr.
1882 *King, George Gordon.*
1892 King, John Hurtin.
1904 King, W. Nephew.

Date of Election.

1901 Kirby, Thomas E.
1881 Kirsch, Louis.
1888 Kissel, Gustav E.
1906 Kittredge, Geo. L.
1904 Knapp, Dr. Herman.
1887 *Knight, George T.*
1901 Kohlman, Charles.
1897 Kohn, S. H.
1901 Kohnstamm, Emil V.
1906 *Kuhn, August.*
1905 La Fétra, Linnæus Edford, M.D.
1895 Landon, Francis G.
1898 Lane, Wolcott G.
1882 Langdon, Woodbury.
1881 *Langdon, Woodbury G.*
1882 Lapham, Lewis H.
1904 *Laughlin, George M.*
1901 Lawrence, Arthur, D.D.
1902 Lawrence, John Burling.
1904 Lawrence, W. B.
1903 Lawson, Victor F.
1906 Lawton, Jas. M.
1886 Leete, C. H.
1906 *Leffingwell, Rev. C. W., D.D.*
1900 *Leggett, Francis H.*
1903 Lehmaier, James M.
1909 Leibinger, Dr. Felix.
1905 Lemon, Dr. J. S.
1909 Le Roy, Edward A., Jr.
1903 Lesher, Arthur L.
1901 *Leupp, William H.*
1902 Leverich, S. Duncan.
1904 Levi, Emil S.
1896 *Lewis, Clarence McK.*
1902 Lewis, Rev. William G. W.
1881 *Libbey, William.*
1903 Lincoln, Lowell.
1902 Linderman, Garrett B.
1905 Lindsey, Edward.
1899 *Lippincott, Henry H.*
1903 Lisman, Frederick J.
1881 *Little, Joseph J.*
1897 *Livingston, Goodhue.*
1909 Locatelli, E. H.
1897 Lobenstine, William C.
1904 Lodge, Henry Cabot.
1900 Loeb, Morris.
1870 *Loew, Frederick W.*
1891 Loewy, Benno.

Date of Election.

1906 Loines, Stephen.
1903 *Lorillard, Pierre.*
1890 *Loth, Joseph.*
1878 *Loubat, J. F., LL.D.*
1908 Loughran, Dr. Robert L.
1883 Lounsbery, R. P.
1906 Lovejoy, Arthur B.
1876 *Low, A. Augustus.*
1875 *Low, Seth, LL.D.*
1903 *Low, William G.*
1905 *Lowell, Percival.*
1886 *Ludington, Charles H.*
1889 Lydig, David.
1900 Lyman, Frank.
1888 *Lynch, James D.*
1906 Lyon, David H.
1903 McConnell, Samuel P.
1895 *McCord, William H.*
1887 McCready, N. L.
1906 *McDonald, Alexander.*
1906 McDonald, Wm.
1903 McDougall, Walter.
1907 McDowall, Walter R.
1901 *McFarlane, C. T.*
1897 McKeen, James.
1888 McKeever, J. Lawrence.
1906 McKnight, Robt. Lewis.
1898 McLean, Donald.
1904 *McMillan, William Northrup.*
1895 McMillin, Emerson.
1903 McWilliams, Daniel W.
1903 Maas, Gustavus.
1905 Macdonald, Benjamin J.
1905 MacDougall, George R.
1903 *Mackay, Clarence H.*
1883 *Mackay, Donald.*
1884 *MacKellar, William.*
1890 Mackey, Charles W.
1898 MacKie, Charles Paul.
1901 Macy, George H.
1901 *Macy, V. Everit.*
1904 Mager, F. Robert.
1899 Mahl, William.
1903 Mann, William D'Alton.
1905 Manning, Charles H., U.S.N.
1874 Marble, Manton.
1904 Marcou, John B.
1895 Marcus, George E.
1888 *Marquand, Henry.*

Date of Election.

1898 Marsh, Joseph A.
1901 Marshall, Charles H.
1897 *Marshall, Louis.*
1898 Marston, Edwin S.
1875 *Martin, Bradley.*
1888 *Martin, Oswald J.*
1905 Marvin, Samuel W.
1888 *Mason, Alexander T.*
1901 Mather, Samuel.
1901 Matthews, Albert.
1899 Matthews, George E.
1903 Maxwell, Francis Taylor.
1901 Maxwell, Robert.
1906 Maxwell, Wm.
1905 Meeker, Stephen J.
1891 Meeks, Edwin B.
1902 *Mellen, Charles S.*
1904 Meredith, William T.
1906 Merrill, Wm. E.
1901 Meyer, Harry H.
1897 Millar, George W.
1909 Miller, Francis Trevelyan.
1901 *Miller, Dr. George N.*
1892 *Mills, A. G.*
1880 *Mills, Darius O.*
1876 Mitchell, W. Howard.
1905 Mixer, Frederick K.
1905 *Mohr, Louis.*
1902 *Monks, John, Jr.*
1890 Montant, Alphonse.
1905 Moody, Arthur Blair.
1906 Moore, C. Arthur, Jr.
1906 Moore, Henry Du Bois Bailey
1904 *Moore, John Bassett.*
1884 *Moore, Joseph, Jr.*
1863 *Moore, W. H. H.*
1883 Morgan, E. D.
1906 *Morgan, Frederick G.*
1874 *Morgan, J. Pierpont.*
1901 *Morgan, J. P., Jr.*
1887 *Morgan, William Fellowes*
1889 Morgan, William H.
1906 Morrell, Joseph B.
1900 Morris, Fordham.
1874 *Morris, Henry Lewis.*
1903 Morris, John.
1897 *Morris, Mrs. Lewis G.*
1906 Morris, Lewis R., M.D.
1898 *Morris, Newbold.*

Date of Election.

1905 Morrison, Charles E.
1902 *Mortimer, Rev. Dr. Alfred G.*
1908 Mortimer, Edmund.
1907 *Mortimer, Richard.*
1864 *Morton, Levi P.*
1898 Moss, Charles H.
1905 Mount, William D.
1906 Moxham, A. J.
1906 Mullins, Edwin Stanton.
1904 Myers, Joseph G.
1888 Myers, Theodore W.
1901 Neeser, John G.
1905 Nelsen, Dr. Wolfred.
1891 Neukirch, Chas.
1897 Nevers, George G.
1899 Newbold, Clement Buckley.
1897 *Newell, F. H.*
1891 *Newman, Mrs. Angeline Ensign.*
1899 Newton, James S.
1906 Nicoll, Courtlandt.
1897 Nixon, Lewis.
1908 North, Arthur Walbridge.
1897 Notman, George.
1905 *Noyes, Isaac Pitman.*
1889 Nunn, R. J., M.D.
1906 Oakes, Charles.
1888 *Oakes, T. F.*
1898 Obermeyer, Joseph.
1879 *O'Brien, Thomas S.*
1901 O'Connor, Nicholas R.
1875 *O'Connor, Thomas H.*
1879 O'Gorman, Richard.
1901 O'Leary, H. A.
1905 *Olyphant, Robert.*
1874 Olyphant, Robert M.
1875 *Opdyke, William S.*
1893 Operti, Albert.
1882 Oppenheim, Edward L.
1889 Orr, Alexander E.
1901 *Orvis, Charles E.*
1903 Osborn, Eugene E.
1905 *Osborn, William Church.*
1901 Outerbridge, Dr. Paul.
1896 Owen, James, C.E.
1895 *Owen, Miss Luella A.*
1905 *Packard, Ralph G., Jr.*
1898 *Paget, Almeric H.*
1909 Palmer, Frederick.
1889 Palmer, Stephen S.

Date of Election.

1899 *Parish, Edward C.*
1872 *Parish, Henry.*
1905 Parish, Henry, Jr.
1905 *Parker, Herschel C.*
1902 *Parker, James H.*
1905 Parks, C. W., C.E., U.S.N.
1886 Parris, Edward L.
1882 *Parrish, James C.*
1882 *Parsons, Mrs. Edwin.*
1905 Parsons, Herbert.
1882 Parsons, John E.
1902 Paton, David.
1897 *Paton, William Agnew.*
1909 Patten, William.
1907 Peabody, Charles A.
1889 Peck, Charles E.
1898 *Pell, Frederick A.*
1906 *Pell, Howland Haggerty.*
1901 Pell, Stephen H. P.
1874 Penfold, William Hall.
1905 Pennell, William W., M.D.
1906 *Penniman, James H.*
1898 Pennington, William.
1903 Pepper, C. H.
1887 Perdicaris, Ion. H.
1908 Perkins, Sandon.
1890 *Perkins, W. H.*
1908 Perry, Rufus Lewis.
1888 Perry, William A.
1906 Peters, Edward G.
1891 Peters, Edward McClure.
1887 Peters, Samuel T.
1903 *Peters, William Richmond.*
1906 Phelps, Dr. Gouverneur Morris.
1901 *Phelps, John J.*
1908 Phipps, Henry.
1902 *Phipps, Lawrence C.*
1887 *Phoenix, Lloyd.*
1886 *Phoenix, Phillips.*
1889 *Pickering, Edward C.*
1905 Pickett, William Douglas.
1895 Pickhardt, Carl.
1902 Pierce, Henry Clay.
1905 Pierce, Robert Morris.
1906 *Pierrepont, R. Stuyvesant.*
1905 Pietrzycki, Marcel. M.D.
1891 Pinkus, Frederick S.
1898 Piorkowski, Capt. A. E.
1885 *Planten, John R.*

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Date of Election.

1893 *Platt, J. D.*
1906 Platt, Lewis A.
1905 Plimpton, Dr. Warren O.
1876 Plum, James R.
1890 *Plumb, Edward L.*
1905 Plumb, Robert E.
1884 *Plush, Dr. Samuel M.*
1906 Poe, I. N.
1906 Poor, Henry V.
1891 *Porter, Henry Kirke.*
1897 Porter, William H.
1905 *Post, Abram S.*
1884 Post, George B.
1885 *Post, William Henry.*
1890 Potter, Edward Clarkson.
1898 Potter, Frederick.
1905 Potter, Richard B., M.D.
1901 *Potts, Jesse W.*
1903 *Potts, Thomas.*
1880 Powell, Wilson M.
1899 Pratt, Wallace.
1897 Prentiss, George Lewis.
1903 Proctor, George H.
1886 Pryer, Charles.
1901 Purdy, J. Harsen.
1905 Putnam, Henry St. Clair.
1897 Putnam, Samuel.
1903 Pyle, James Tolman.
1894 *Pyne, M. Taylor.*
1898 *Pyne, Percy R.*
1906 *Queen, Emmet.*
1908 *Radford, Harry, M. Sc., C.E.*
1903 *Randolph, Evan.*
1906 Randolph, Stewart F.
1868 *Raven, Anton A.*
1905 *Raven, John Howard, D.D.*
1898 *Rawson, Edward Stephen.*
1890 Raymond, Charles H.
1886 *Raymond, R. W.*
1902 Rea, Samuel.
1901 *Rea, Thomas B.*
1902 *Ream, Norman B.*
1905 Reckefus, Charles N., Jr., M.D.
1898 Redding, Joseph D.
1903 Reed, Charles.
1874 Reid, Whitelaw.
1901 Reiff, Josiah C.
1888 Renwick, Edward S.
1905 Reynes, Antonio.

Date of Election.

1874 *Reynes, Jaime.*
1903 *Reynolds, James B.*
1882 Rhinelander, Charles E.
1898 *Rhinelander, Miss Serena.*
1886 *Rice, Isaac L.*
1903 Richard, Edward A.
1901 Riker, Samuel.
1874 Riker, William J.
1901 Rives, George Barclay.
1887 *Robb, J. Hampden.*
1872 *Robbins, Chandler.*
1891 Robbins, Miss Harriet L.
1903 Robin, Joseph G.
1901 *Robertson, Julius.*
1907 Robinson, Dr. E. S.
1901 *Robinson, Nelson.*
1905 Robinson, Seth B.
1888 Robinson, William M.
1908 Rockwood, Charles G. Jr., Ph.D.
1903 Roe, Albert S.
1890 Roe, Major-Gen. Charles F.
1889 *Roelker, Alfred.*
1906 Rogers, Abbott S.
1887 *Rogers, Archibald.*
1905 Rogers, Edward L.
1903 *Rogers, Robert.*
1896 Roncière, St. Croix de la.
1905 *Roosevelt, Franklin Delano.*
1868 Rose, Cornelius.
1903 Ross, Morgan R.
1906 Rothschild, C. G.
1905 Ruprecht, Philip.
1897 Rusch, Henry A.
1899 Russak, Frank.
1874 *Russell, Archibald D.*
1889 Ryan, Thos. F.
1906 Sachs, Arthur.
1906 Sachs, Paul J.
1905 Sachs, Samuel.
1898 Salomon, William.
1901 *Sampson, Alden.*
1904 Sampson, Charles E.
1875 *Sandford, Elliott.*
1895 Sands, Robert C.
1908 San Marzano, Robert Asinari de.
1886 Satterlee, F. LeRoy, M.D.
1903 *Satterlee, Herbert L.*
1904 Saul, Charles R.
1870 *Schafer, Samuel M.*

Date of Election.

1897 Schaus, Hermann.
1874 *Schermerhorn, F. Augustus.*
1890 Schernikow, Ernest.
1898 *Schieffelin, George R.*
1875 *Schiff, Jacob H.*
1902 *Schiff, Mortimer L.*
1903 Schirmer, Rudolph E.
1903 Schloss, Henry W.
1885 Schmelzel, William R.
1901 Schmid, Dr. H. Ernest.
1905 *Schott, Charles M., Jr.*
1888 *Schultze, John S.*
1882 *Schuyler, Spencer D.*
1902 *Schwab, Charles M.*
1883 Scott, Rufus L.
1906 Scribner, Charles.
1895 Scudder, Moses L.
1905 Scull, Harry.
1897 See, Horace.
1901 Seligman, Isaac N.
1887 Sellew, T. G.
1903 *Sells, Elijah W.*
1902 Seward, Frederick W.
1898 Seward, Gen. William H.
1893 *Sexton, Edward Bailey.*
1905 Shailer, William Griggs.
1871 Shaler, Major-Gen. Alexander.
1897 *Shardlow, Joseph.*
1903 Shaughnessy, Sir Thomas G.
1893 Shaw, Charles A.
1906 *Shaw, Walter W.*
1897 Sheehy, W. H.
1905 Sheffield, George St. John.
1888 Sheldon, Edwin B.
1906 Sheppard, James J.
1888 *Sherman, Charles A.*
1886 *Sherman, George.*
1865 *Sherman, W. Watts.*
1903 Sherwood-Dunn, B.
1898 Shillaber, William, Jr.
1906 Shrady, John, M.D.
1876 *Sibley, Hiram W.*
1903 *Siegel, Henry.*
1903 Siegel, Jacob.
1903 Simpson, Ernest L.
1898 Simpson, William T.
1905 Skinner, Robert Peet.
1906 Slater, James.
1899 Smiley, Albert K.

Date of Election.

1901 Smillie, Charles F.
1893 Smith, Benjamin E.
1890 *Smith, Sir Donald A.*
1902 Smith, Dr. E. Fayette.
1879 *Smith, E. Reuel.*
1906 Smith, George H.
1899 Smith, J. Frailey.
1887 Smith, James Rufus.
1887 Smith, Nathaniel S.
1901 Smith, Ormond G.
1889 Smith, Philip Sherwood.
1883 Smith, William Alexander.
1890 Snow, Elbridge G.
1903 Snow, Fred W.
1909 Solari, Luigi.
1904 Soulsby, Basil Harrington.
1880 *Southwick, Henry K.*
1906 Spangler, Harry A., M.D.
1883 Spence, Lewis H.
1905 Spencer, Edwards.
1905 Spencer, Henry B.
1906 Speranza, Gino C.
1905 *Speyer, James.*
1856 Spofford, Paul N.
1906 Spohn, Arthur Edward, M.D.
1904 Squires, Grant.
1897 Standish, Miles.
1905 Stanton, Robert Brewster.
1907 Stefánsson, V.
1903 Steinway, Frederick T.
1904 *Sterry, John DeWitt.*
1879 Stetson, Francis Lynde.
1887 *Stetson, George W.*
1906 Stevens, Arthur W.
1879 *Stevens, Frederick W.*
1901 Stevenson, Edward Luther, Ph.D.
1898 Stevenson, Paul Eve.
1895 Stevenson, R. W.
1905 Stewart, John H. J.
1887 Stewart, Lispenard.
1878 Stewart, William Rhinelander.
1901 *Stickney, Charles D.*
1905 Stillwell, Arthur E.
1905 *Stillwell, Lewis Buckley.*
1897 Stine, Marcus.
1904 Stokes, Anson Phelps.
1892 Stokes, I. N. Phelps.
1884 Stokes, James.
1883 Stone, Sumner R.

Date of Election.

1889 Straus, Isidor.
1903 Strauss, Frederick.
1906 *Strong, Charles Hamot.*
1904 Strong, George A.
1906 Stuart-Wade, Dr. C. H.
1904 Stuck, Rev. Hudson.
1873 Sturges, Frederick.
1875 Sturges, Henry C.
1906 Sturges, Rush.
1873 *Sturgis, Frank K.*
1901 Sturgis, Thomas.
1872 *Stuyvesant, Rutherford.*
1891 *Suckley, Robert B.*
1887 Sutton, J. Ford, D.D.
1903 Sutton, James F.
1893 Swayne, Francis B.
1906 Sweet, Henry N.
1905 Swords, Henry C.
1882 *Tailer, Edward N.*
1906 *Talbot, Fritz B., M.D.*
1877 *Talcott, James.*
1889 Tatham, Charles.
1902 Taylor, Charles H., Jr.
1868 Taylor, Douglas.
1906 Taylor, Ellsworth M.
1906 Taylor, Frank B.
1895 Taylor, George.
1903 Taylor, Henry R.
1901 Taylor, Walter C.
1882 *Terry, John T.*
1876 *Terry, Rev. Roderick.*
1901 Terry, Walter Phillips.
1900 Tesla, Nikola.
1883 Thalmann, Ernest.
1891 Thaw, Benjamin.
1905 *Thebaud, Paul G.*
1905 *Thomas, William S., M.D.*
1898 Thompson, D. W.
1904 *Thompson, Mrs. Frederick F.*
1901 *Thompson, Lewis S.*
1898 Thompson, Walter.
1902 *Thomson, Elihu.*
1886 Thorne, Jonathan.
1890 Thorne, Samuel.
1906 Tindall, Henry B.
1891 *Tobey, Gerard C.*
1906 Townsend, Edwin S.
1900 Tracy, J. Evarts.
1893 Trusdell, Warren N.

Date of Election.

1899 *Tucker, George F.*
1905 Tucker, William C.
1901 *Tuckerman, Alfred.*
1908 Tuckerman, Bayard
1901 Tuckerman, Paul.
1900 Turnure, George.
1909 Tweed, Charles H.
1905 Uhle, John B.
1905 Ulich, H. P.
1891 Ullmann, Emanuel S.
1891 Ulmann, Ludwig
1897 *Underhill, Eugene.*
1906 *Vaile, Joel F.*
1887 *Van Alen, J. J.*
1897 Van Antwerp, William C.
1908 Van Boskerck, Miss Lizzie.
1907 Van Cortlandt, Robert B.
1889 *Vanderbilt, George W.*
1878 *Vanderbilt, William K.*
1906 Van Dusen, Capt. James Wallace.
1902 *Van Rensselaer, A.*
1905 Van Sinderen, Howard.
1887 *Van Slyck, George W.*
1891 *Van Winkle, Edgar B.*
1906 Veeder, Curtis H.
1903 Veit, Richard C.
1887 Verastegui, Alberto de.
1900 *Vetter, Dr. Charles.*
1901 von Briesen, Arthur.
1875 *von Post, Herman C.*
1903 von Schmid, J. O.
1899 Vorse, Albert White.
1907 Wack, Henry Wellington.
1890 *Wadsworth, Herbert.*
1898 *Wadsworth, Wm. Austin.*
1898 Wait, William B.
1908 Walker, Amasa.
1900 Walker, Henry Freeman, M.D.
1905 Wallace, Dillon.
1906 Wallace, Gurdon B.
1898 Warburg, Felix M.
1905 Ward, John Gilbert.
1900 Wardwell, William T.
1902 *Warren, Samuel D.*
1895 Warren, William R.
1909 Wasson, Rev. Dr. James B.
1889 Waterbury, John I.
1898 *Watkinson, George.*
1879 *Watson, Francis A.*

Date of Election.

1884 *Watson, George H.*
1876 Wedemeyer, A. J. D.
1900 *Wehrhane, Charles.*
1906 Weimer, Edgar A.
1903 *Weir, Col. John.*
1895 Wells, Charles W.
1905 Wells, Mrs. John.
1905 Wells, T. Tileston.
1907 Wentz, Theodore.
1898 Weston, Edward, Sc.D., LL.D.
1906 Weston, Frederick W.
1888 Wetmore, Edmund.
1874 *Wetmore, George P.*
1872 *Wetmore, William Boerum.*
1901 *Wetmore, W. S. K.*
1905 Wheeler, John Davenport.
1906 Wheeler, Samuel H.
1907 Whinery, Charles C.
1905 Whitaker, John E.
1903 White, Abraham.
1905 White, Alain C.
1887 White, Alfred T.
1887 *White, Henry.*
1887 *White, J. LeRoy.*
1886 *White, S. V.*
1887 White, William Augustus.
1905 White, William H.
1901 Whitehouse, William FitzHugh, Jr.
1898 Whitfield, R. P.
1903 Whitney, Horace P.
1891 Whitney, Milton B.
1902 *Whitney, W. Beaumont.*
1908 Wickersham, George W.
1898 Wilkins, Hartwell A.
1901 *Willets, Howard.*
1900 Willets, John T.

Date of Election.

1882 *Williams, David.*
1902 *Williams, John Skelton.*
1901 Williams, John T.
1906 *Williams, Richard H.*
1901 *Williams, Timothy S.*
1893 Wills, Charles T.
1905 Wilmerding, Gustav L.
1903 Wilson, Henry R.
1870 *Wilson, Gen. James Grant.*
1909 Wilson, M. Orme.
1875 Winslow, Gen. Edward F.
1901 Winslow, John Flack.
1902 Winter, Emil.
1900 *Winthrop, Grenville L.*
1888 Witherbee, Frank S.
1891 Wolcott, Henry Roger.
1897 Wolff, Emil.
1905 Wood, Henry A. Wise.
1903 Wood, Henry R.
1900 Wood, Orrin S.
1898 Woods, Edward A.
1888 *Woodward, James T.*
1906 Worrall, Charles Addams.
1905 Wray, Albert A.
1904 Wright, J. Dunbar.
1886 Wright, William Phillips.
1907 Wunderlich, Frederick W., M.D.
1902 *Wyckoff, Clarence F.*
1902 *Wyckoff, Edward G.*
1901 Wyckoff, William F.
1905 Yeisley, George C., D.D.
1884 *Zabriskie, Andrew C.*
1898 Zaring, Charles W.
1905 Zickel, S.
1905 Zucker, Peter.

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GEOGRAPHICAL RECORD.

NORTH AMERICA.

CLIMATE AND THE DEVELOPMENT OF CANADA.—In a recent article on "The Railway Development of Canada" (*Scot. Geogr. Mag.*, May, 1909), the author, Dr. George R. Parkin, makes some striking allusions to the important part which climate has played in the development of the railway systems of that country, and to the control which climate will have over the future population. The magnificent waterways of Canada, with the improvements that have been made by the construction of connecting canals, are prevented by the severe cold from serving as highways of travel and transportation during the winter months. For this reason, largely, there has come the remarkable railroad development of the last fifty years. As the author well says:

"For local transportation, as in many other respects, Canadian snows and frosts are among the greatest advantages that the country possesses, but for transcontinental traffic by water they interpose for long periods an insuperable barrier."

Dr. Parkin also points out very clearly that the winter climate of Canada is perhaps the most valuable asset that the country can have, or that any country can have. The severity of the climate, except on a small part of the Pacific coast, eliminates the negro question, "which weighs like a troublesome nightmare upon the civilization of the United States, which shadows the future of South Africa, and gives many anxieties even to Australia." The cold keeps away the peoples from Southern Europe, who do not readily assimilate with the Anglo-Saxon stock, and attracts the hardier emigrants from Northern Europe. The strength of the best races of Europe is thus secured. The severe winter cold develops energy, prudence and foresight. If a man lacks these, he cannot survive: he must either go away to the warmer south, or he dies, if he has made no preparation for protecting himself. "So he must choose between a bracing-up of character, or flight, or death." Thus the race will be kept strong and homogeneous. Climate will tell. R. DEC. W.

SOUTH AMERICA.

THE TRANS-ANDEAN RAILROAD.—The great enterprise by which Chile and Argentina are to be connected by railroad is approaching completion. The *London Times* (Weekly edition, No. 1687,) says that the time now arranged for the opening is June, 1910, which is 11 months earlier than the time announced at the last annual meeting of the Argentine Transandine R.R. Co.

This engineering feat will rank among the most remarkable achievements. It will be the first transcontinental railroad line across South America from the Atlantic and one of the four rail outlets by which Chile, separated by the Cordilleras from most of her sister republics, will be able to communicate freely with other countries. The Antofagasta and Bolivia R.R. was the first step taken towards this end; the second is the transcontinental enterprise now approaching completion; a third will be another crossing of the Andes at one of the low passes above

Copiapo, to connect with the Argentine lines from Tucuman and with the Bolivian system; and the fourth will be the Arica-La Paz R.R., whose building has begun this year.

Natural obstacles and other difficulties continually intervened in the construction of the Argentine section of the transcontinental line between Mendoza and Uspallata, in the Andes. Many engineers considered the further progress of the road as unlikely though not impossible. The construction work in many places in the Andes has been of a very heavy nature, requiring elaborate cuttings both in gravel and rock and extensive defences to protect the line against river floods. The most serious engineering work on the Argentine side was in the part of the route leading up to La Cumbre Pass, 12,603 feet above the sea, where the mountains were pierced by a series of difficult tunnels. The Abt system of cogs and racks is employed for the safe and expeditious movement of trains.

On the Chilean side of the Andes the construction of the line has proved hardly less difficult and quite as costly. Between Rio Blanco and Juncal are three avalanche sheds to protect trains from the enormous masses of snow which collect on the mountain sides and are often precipitated upon the line. The first section, between Los Andes and Juncal, 32 miles, was opened for traffic on Feb. 12, 1906; the second section, between Juncal and Portillo, in an exceedingly wild and difficult district, was opened in June, 1908, well within the specified time; the third section, from Portillo to the junction with the Argentine line, soon to be completed, has a tunnel, 9,940 feet long, a very difficult piece of construction.

POLAR.

Lieut. Shackleton's Expedition.—Some interesting detais of the scientific achievements of the British Antarctic expedition are reproduced in *Nature* (No. 2065) from the *London Times*. They are based upon information supplied by Prof. Edgeworth David. A number of the rotifers found in the lake muds were of the same variety as those already described by the biologist of the expedition (Murray) in Spitzbergen and Franz Joseph Land. A point of special interest in regard to the marine fauna near Cape Royds is that it may provisionally be concluded that it bears some distant resemblance to the types of animal life of the Coal-measure series of Australia and Tasmania. The possibilities of the Antarctic having been an archipelago can no longer be entertained. There is a high continental plateau extending from the new mountains recently discovered by the *Nimrod* expedition, forty-five miles west of Cape North, to the magnetic pole, and then across the plateau traversed by Captain Scott of the *Discovery*, and over the portion traversed by Lieut. Shackleton in his furthest south journey, to beyond the South Pole itself—probably a distance of 1,800 miles. The most interesting geological discovery was that of Coal-measures at least 1,500 feet thick in latitude 85° S. There were at least seven seams of outcrop in the cliff face of the great nunatak where the discovery was made; they varied in thickness from 1 foot to 7 feet. Abundant small fossil root impressions were present in the fire-clay found with some of the seams. The general geological results of the expedition show that there is a very ancient series of crystalline rocks similar to those already described by Ferrar, of the *Discovery*, forming the foundation platform from near the South Pole to Cape North. The whole of this basal series gives every promise of minerals of the rare earths in more or less abundance. Superimposed upon

these basal beds is the sandstone formation already described by Ferrar as the "Beacon" sandstone. Above the sandstones, on a series of volcanic rocks, occur immense lava sheets more or less horizontally bedded. As regards volcanic eruptions, it is interesting to note that Erebus, like Stromboli in the Mediterranean, formed a good barometer, for as the mercury fell in the barometers of the expedition, so did the steam cloud over Erebus rise higher and higher. Nearly all the principal steam eruptions took place when the barometer was at its lowest.

MR. WELLMAN'S PROJECT.—Mr. Wellman with his arctic airship, is again on his way to Spitzbergen, where, if the conditions are favourable, he will renew his efforts to reach the North Pole. It is reported that this time his airship will be dirigible and modelled after that invented by Count Zeppelin.

MR. BALDWIN'S PROPOSED ARCTIC EXPEDITION.—Mr. Evelyn B. Baldwin's announcement that he will undertake the organization of an expedition to cross the Arctic Ocean is having wide publicity at home and abroad and some of his new suggestions have been approved by polar travellers as likely to prove very practical and useful. He desires to enter the pack-ice to the northwest of Point Barrow, Alaska, as far north as possible in about 160° W. Long., which position would locate him more than 100 miles east of the besetment of the *Jeannette* and 60° east of the point where the *Fram* entered the pack ice. He proposes to place upon one of the large floes, near the edge of the pack, a large number of logs, casks of oil, emergency supplies and clothing, some portable houses, etc., not only as a means of protection in case the ship should be lost either by crushing, fire or explosion, but also as a direct means of conducting side expeditions along the course assumed by the ship in her drift.

This course, he argues, will, in general, be parallel with the courses of the *Jeannette* and the *Fram,* as, owing to the packed condition of the ice, the ship can not vary far either to starboard or port of the natural line of progression. He points to the generally straight-forward character of the drift of the two vessels mentioned and believes it evident that an expedition starting from the point designated would be carried northward very near to, if not immediately across, the pole and thence south between the east coast of Greenland and Spitzbergen.

With his large experience as a participant in two expeditions to Franz Josef Land and one to the north coast of Spitzbergen in the matter of gathering drift-timber, Baldwin's observations as to the uses to which logs or other forms of timber may be put are of importance. Their value for fuel and as material for repairing boats and building shelters is evident, but Mr. Baldwin also proposes to employ them to re-strengthen his ship as the cargo is removed, and, during the summer months, as a bed upon which to grow cress, mustard and such other garden truck as are known to flourish during periods of polar sunshine. He would carry with him a sufficient quantity of specially prepared soil and fertilizing material to be placed in the natural grooves which would be formed by placing the logs side by side, or in holes or troughs to be chiseled from the logs themselves. At the close of each summer the soil is to be replaced in sacks or other receptacles. By means of tubing running beneath the soil of the garden, currents of warm air may be employed to stimulate the growth of the plants, the oil from the casks supplying the necessary fuel. Glass and blanket material will be used as protection during cool weather.

A part of the supply of timber it is proposed to use as flooring spaces for the

dogs and Siberian ponies, and for the construction of signal and observatory towers at considerable distances from the ship. Owing to the great amount of work to be done on both sides of the line of drift, Mr. Baldwin proposes to adhere to his method of using Siberian ponies and dogs conjointly which he successfully employed in Franz Josef Land in 1901-2. Lieut. Shackelton used ponies with brilliant success in his recent march toward the South Pole.

The slowness of the drift of the pack-ice (average rate, two miles a day), will permit expeditions of considerable duration to be undertaken. The lines of march of these side expeditions are to be marked at intervals with permanently established signal poles and small sub-stations, the relative positions of which will be noted from time to time. Soundings, marine collections, and scientific observations will thus be secured at many points throughout a wide belt of unexplored territory embracing more than 2,000,000 square miles and 2,000 miles across it.

In a recent address before the Aero Club of America, Mr. Baldwin said that he could also employ the dirigible and other balloons, as well as kites and aeroplanes to great advantage in connection with his plan. Having manufactured the gas for and successfully dispatched fifteen message-bearing balloons from Franz Josef Land in 1902, a number of which were afterwards found, he is confident that he can again accomplish good results in the same direction.

EDUCATIONAL.

Representation of Land Forms in the Physiography Laboratory.—Prof. R. S. Tarr of Cornell University has published some of the simpler results of five years or more of experiment in devising methods of indoor field work in physiography (R. S. Tarr and O. D. von Engeln, *Journal of Geography*, Vol. VII, 1908, 73-85). Briefly, the method employed by these teachers has been to follow up the out-of-door field work by experiments in artificially-constructed land forms, worked upon by miniature agencies analogous to those at work in nature. This is done in the so-called wet laboratory, where work on erosion and deposition, volcanic action, glacial deposits, and mountain folding has been successfully carried on.

For work on erosion and deposition a simple basement laboratory with water supply was outfitted. In this room a tank 8 feet square and 16 inches deep containing a smaller tank 5½ feet square and 14 inches deep was built, the inner tank being capable of raising and tilting adjustments. Sand and clay of various consistencies, and hose with fine sprayers complete the outfit.

Contours are taught by graphically outlining successive levels of a simple land form in water, the student drawing each contour while marked out by a water line. Lessons in erosion and deposition are graphically presented and other physiographic phenomena made clear. The experimental work, partly for elementary and partly for advanced students in physiography, is correlated with studies of maps and models. L. M.

The Course in Commerce at the University of Wisconsin.—This course, which was opened in 1900 (*Bull. Amer. Geog. Soc.*, 1904, 422-423) has had steady growth. There were 85 students the first year, 1900-1901, and 216 in the present year, 1908-9. Prof. W. A. Scott is Director of this course. Facilities are supplied for young men intending to enter business careers, especially in the

fields of domestic and foreign commerce and banking, and branches of public employ like the consular service. The course consists of (a) fundamental courses, including physical geography as a basis for economic geography, as well as other natural sciences, mathematics, English, foreign languages, history, and economics; (b) professional studies, including business correspondence and forms of documents, accounting, auditing, salesmanship, advertising, credits, and collections, and the management of factories and other business concerns; (c) elective studies in related groups, like banking, transportation, accountancy, organization, insurance, corporation finance, manufacturing industries, agricultural problems, commercial law, the consular service, foreign commerce and other electives.

Among the partly or wholly geographic courses incidental to various portions of the work in commerce as required studies or free electives are (a) the systematic physical geography or physiography already mentioned, courses in regional geography of various units like the World, North America, and Wisconsin, and advanced physiography, all offered by the writer; (b) courses in meteorology and climatology offered by Mr. E. R. Miller of the U. S. Weather Bureau; (c) courses in economic geography of the World and of the United States, and in agricultural economics, etc., offered by Prof. H. C. Taylor; (d) courses in anthropology, races, etc., offered by Mr. C. H. Hawes; (e) courses in contemporary international politics, etc., by Prof. P. S. Reinsch, and (f) a synoptic course on the conservation of natural resources by President C. R. Van Hise. L. M.

VARIOUS.

Geographical Kalender for 1909.—This is the seventh issue of the Annual. Its editor, Dr. Hermann Haack and the house of Justus Perthes are to be congratulated on the fact that this work of reference is becoming more useful every year. The present issue contains 781 pp., in addition to a large number of geographical and other advertisements.

For several years, the Kalender has been introduced with a portrait and biography of some geographer of international reputation. American geographers will be glad to see that this compliment is now paid to Professor William M. Davis, of Harvard, the large results of whose studies and his formative influence upon geographical investigation and education are now widely recognized in Europe as well as in his own country. The publisher was fortunate in securing this sketch of Professor Davis's life work from the pen of Professor Albert P. Brigham, than whom no American writer is better qualified, both in a geographical and a literary sense, to prepare such an appreciation of eminent service rendered to geography. The paper is accompanied by an excellent portrait of Professor Davis and is printed both in English and in German.

Among the other contents are the "Geographische Chronik" (69 pp.), a record of important events during 1908, such as the completion of boundary surveys, meetings of scientific congresses, colonial progress, destructive storms, etc.; "Geographische Forschungsreisen des Jahres 1908," 52 pp.; "Geographische Literatur des Jahres 1908," 88 pp.; "Die Toten des Jahres 1908," 34 pp.; and the "Geographisches Adressbuch, A.," containing the names, addresses and position of many hundreds of geographers and specialists in related sciences. Seventeen maps in colours, showing new explorations, etc., illustrate the volume, together with a number of the black and white sketches of Bogoslof that appeared in Professor Jagger's paper in the *Bulletin* of this Society (August, 1908).

GEOGRAPHICAL LITERATURE AND MAPS.

(INCLUDING ACCESSIONS TO THE LIBRARY.)

BOOK NOTICES.

A Canyon Voyage. By Frederick S. Dellenbaugh. xx and 277 pp., 50 Illustrations, and Index. G. P. Putnam's Sons, New York, 1908. Price, $3.50.

Mr. Dellenbaugh, as is well known, was one of the party with whom Major Powell made his second journey down the canyons of the Green-Colorado river. It was this expedition (1871-72) that continued and enlarged upon the explorations of 1869 when Major Powell made his famous first descent of the river. This rarely equalled feat of pioneer exploration was one of heroic daring, but it was limited by circumstances to three months, and it was necessary to supplement it with another journey in order to obtain the geologic, hydrographic, and hypsometric data, the topographic surveys, photographs, and other material required to make a map of the river and its canyons. Nearly two years were given to the work, including the time spent at two winter camps. Major Powell gave his attention chiefly to geologic studies and the problems of the great canyons; Professor A. H. Thompson was the geographer and topographer; Mr. Dellenbaugh was the artist, and, later, assistant topographer, and six other men completed the party.

The great amount of material, collected by the expedition, was used in preparing Major Powell's well-known report, "Exploration of the Colorado River of the West, 1869-1872." The map of the river made by this party was the basis of later mapping and the rich results of the expedition were the foundation of further research. It is a little remarkable that no history of the expedition, with all its varied and unusual experiences, was ever given to the public till Mr. Dellenbaugh wrote this book. He is the authorized and rightful historian of this notable exploration. In 1902, Major Powell wrote to him that he hoped he would put on record the second trip and the men who carried out the work; and the late Professor Thompson wrote to him, in 1906: "You are the heir to all the Colorado material and I am getting what I have together."

Mr. Dellenbaugh's book tells the complete story of that long and thrilling journey. It is a narrative of daily experiences and of actual camp life told with literary charm and a sense of humour; for in the many days of danger, when nerves were tense and prospects were grim, there was the sunny side of things even in the depths of the shadowy chasms that walled them in. The situation that often confronted these men, for weeks at a time, was that if they were wrecked while dodging the rocks in the foaming rapids, they might be left without food; for even if they might scale the imprisoning walls, the desert wilderness above would still hem them in. This pleasant contingency, by the way, is not mentioned in the book, but it is perfectly obvious; and any reader who would

like to have a vivid idea of what it means to travel for many months in a swirl of waters at the bottom of rugged chasms hundreds to thousands of feet in depth, where the roar of rapids sometimes drowns the voices of comrades at your side, will get a better conception of it from this book than from anything else that has been written.

The book is edifying as well as entertaining, for the reader gets from it a good general idea of the more prominent phases of information that were the fruit of the enterprise. But Mr. Dellenbaugh has not recapitulated the geological and other scientific details so fully presented in the reports of Powell and others. His part of the literary results is the history of the memorable journey, and no story of the kind was ever better worth the telling. All the material needed for a full and accurate account of this Colorado voyage was in his hands and he has woven it into a very careful and readable narrative. The book was needed to complete the history of the pioneer efforts to solve the mystery of the Colorado Canyons.

Handbook of Alaska, its Resources, Products and Attractions. By Major-General A. W. Greely, U.S.A. xiii and 280 pp., 25 Illustrations from Photographs, 8 Maps, Tables and Index. Charles Scribner's Sons, New York, 1909. Price, $2.00.

No aspect of Alaska that has interest for our citizens is neglected in this Handbook. This immense and valuable Territory is growing in importance every year, and still Alaska is comparatively unknown to the larger part of our people and erroneous information about it is widespread. It was time such a handbook was written, and it is fortunate that this work, which thoroughly covers the field, is from the pen of an American who was probably better fitted to write it than any other man. Major-General Greely has been familiar with the Territory for nine years. He has visited it six times, travelled very widely in various parts of it, directed the building of over 4,000 miles of its military telegraph lines, submarine cables and wireless, and, twice, has been in supreme military command of the vast domain. Not only does he know his subject, but he has seen Alaska with the eyes of an explorer and geographer of international fame who is also keenly alive to all its potentialities. With this equipment, he has written a book filled with definite and accurate information to meet the needs of the student, of those interested in Alaskan development or commercial enterprise, and of those who plan a visit to Alaska for business, pleasure or research or to seek a permanent home there.

The author first gives a general description of the Territory, its geographical features, climate, its waterways, roads and railways. A brief statement of the work of the army, which has played an important part in the exploration, government and development of Alaska, is followed by a significant chapter on the possibilities of agriculture, the forest resources and the reservations established for the preservation of mammals and birds and other purposes. Then comes a clear and orderly treatment, in 65 pages, of the metals and coal in Alaska, conveying a good idea of the distribution of the mineral wealth and what is being done to develop it. From the chapters given to the fur seal and the fisheries of Alaska many will derive their first idea of the great importance which Alaskan fishing has assumed. "Apart from gold-mining, the salmon fishery is the overshadowing industry in Alaska." The chapters on "Tourist Trips," "Glacier Regions" and "Mountains" are full of the informing matter essential for the best guidance of

travellers. The concluding third of the book contains a rich store of facts concerning the native and white inhabitants, education and missions, game, scientific fields of research still open for the student, trade and transportation, and some details of parts of Alaska outside the usual routes of travel. The book concludes with climatic and statistical tables, lists of the mountains, volcanoes and glaciers and a good index. It is both good reading and handy and dependable for reference; and with occasional revisions it will doubtless be long before it is supplanted in the field it is the first to fill.

Der Alpinismus und der Deutsch-Österreichische Alpenverein. Von Dr. A. Dreyer. viii and 200 pp., Illustrations, and Indexes of Authors and Places. Marquardt & Co., Berlin, 1909.

The book contains the combined histories of Alpine sport and the German-Austrian Alpine Club. In the general part, the author has compiled an interesting collection of data illustrating the slow process of the wakening of man to the beauties of Alpine landscape, from the state of superstitious awe inspired by the real or supposed horrors and dangers of the mountains. The deterrent influence of the latter seems to have been so powerful that even Mt. Blanc was not known, at least has not been found recorded on any map, before the seventeenth century. The Swiss savant Scheuchzer did pioneer work in taking his students, from 1702 to 1711, on regular excursions to the mountains, the results of which were embodied in his "Itinera Alpina" (publ. 1723). But it was not until Rousseau's writings attracted multitudes to the places hallowed by the "New Heloise" that the Alps were artistically or touristically discovered.

After that, in the middle of the 18th century, travels to Switzerland began to become popular in France, Germany, and England: Klopstock, Wieland, Goethe, Byron immortalized what they saw in their verses, and Schiller's "Wilhelm Tell" was the first expression of the awakening general enthusiasm for Switzerland. Then began the era of the famous first ascensions of the higher peaks, inaugurated by Professor de Saussure, the conqueror of Mt. Blanc, and continued in a splendid series of exploits by the English Alpine Club. What this Club did for the Swiss Alps, the German and Austrian Clubs, later combined into one, did for the Bavarian and Austrian Alps. The main difference between the English and the continental organization is that the former includes only Alpinists of renown, while in the latter everybody interested in Alpine sport or study may become a member, which secures this club a large membership and large means, which are spent for improvement of the touristic conditions in its territory and for the publication of two magazines of scientific and popular character. The statutes and by-laws of this club are reprinted in the appendix, together with other matter valuable for the information of intending members and of alpinists in general.

M. K. G.

Conditions of Life in the Sea. A Short Account of Quantitative Marine Biological Research. By James Johnstone. xiii and 332 pp., Chart, Illustrations, Bibliography, 7 Appendixes, and 2 Indexes. The Cambridge University Press, Cambridge, and G. P. Putnam's Sons, New York, 1908. Price, 9s.

Many of the ordinary facts of oceanography, and some of the features of the North Atlantic Ocean, are given as preliminary to the quantitative researches which form the author's main object in writing. In one of the preparatory chap-

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ters is a general explanation of the categories, nekton, plankton and benthos, including reference to plant or animal groups which belong to these classes temporarily or permanently. Thus many free-swimming larvæ belong to the plankton but become benthic or nektic in their adult existence. This arrangement provides for their distribution to the limits of suitable environment. The seasonal development of many of these organisms is shown to be very marked and is exhibited by instructive diagrams on pages 95-96.

The second part of the work opens with quantitative plankton investigations and gives the technical methods of such research—matters of more especial interest to the student of marine biology. The geographic interest culminates in the chapters on the "Census of the Sea" and the "Productivity of the Sea." The numbers of planktonic organisms for a column of water one square meter in cross section are given for the North Sea and they run far into the millions.

Among the more practical facts of such investigation is the determination of the number of eggs spawned by certain fish and the consequent number of females of those species which have produced them. Hensen and Apstein thus estimate the number of spawning cod, haddock, plaice, flounder and two other edible species in the North Sea in the spring of 1895. The estimate is 1,200,000,000 in round numbers. Adding the mature males and the immature fish of both sexes, the estimate rises nearly to 10,000,000,000. Confidence is expressed in the approximate correctness of this reckoning. The materials for such tentative enumerations are afforded by plankton investigations, fishing experiments and the commercial fishing statistics. The fishing fleets of European nations in 1904 landed nearly 1,000,000 tons of fish from the North Sea. This gave an average of 15 pounds per acre, per annum. All the fishing grounds of northern Europe yielded in the same year 1,500,000 tons. Morecambe Bay, taken as an illustration of inshore fishing grounds, yielded 79 pounds per acre in 1906, while the Conway mussel fishery afforded 8,700 pounds per acre.

Fresh water cultivated carp ponds in Germany yield from 58 to 141 pounds for each acre. Ringhole, on the coast of Lancashire, an area of 25 acres, produces in dry organic substance, of mussels redeposited there, 900 pounds per acre. Naturally, the estimate for the total productivity of such an area as the Baltic or the North Sea, offers a much more complicated problem. The author likens the plankton to cereals and land pastures, both furnishing food to animals which in turn offer support to man.

On the relative productivity of the sea and land, it is stated from available data, that 83.5 kilograms of beef may be produced per hectare as compared with 65 to 164 kilograms of carp, or 4,000 to 8,000 kilograms of mussel flesh. In terms of dry organic substance a hectare of land in comparison with the Baltic Sea plankton offers a ratio of 1,790 to 1,500 kilograms. It is regarded as unquestionable that the North Sea is richer in life than the adjoining lands. The sea has no sterile tracts and therefore for equal areas has undoubted advantage.

Without doubt, man may impoverish those forms of life which he seeks, even in the ocean, as shown by diminishing returns in North Sea fishing. Estimating from percentages of marked fishes recaught on the same ground, it is believed that one-fourth of all the fish present may be caught by fishing operations. By comparing the number of cod or plaice eggs in a given area with the number which would have been spawned by captured females, results are obtained which command the confidence of the author. Considerable evidence is offered to show that life in cold seas is at least not less abundant than in warm latitudes. This

unexpected result, offers, as Kjellmann suggests, an insoluble problem, where an Arctic haul may bring up strong vegetation from the waters of an ice-covered ocean. The later chapters of the work relate to various phases of the metabolism of the sea.

The volume is one of the Cambridge Biological Series and contains a coloured map of the British Plateau and Norwegian sea, a number of illustrations in the text, several brief appendixes and an index. A. P. B.

Aux Indes et au Népal. Par Docteur Kurt Boeck, traduit par François Ricard. vii and 258 pp., and 58 Illustrations. Hachette & Co., Paris, 1907.

An extremely interesting and well-written volume on India and Ceylon. Many of the descriptions are exceedingly graphic and clear and the illustrations are superb. The author includes much that is of a personal nature that adds little to the value of the text, but his chapters are on the whole clear and his expressions are often almost epigrammatic. Yet, on the whole, the volume presents little that is new in reference to the countries treated, though it should be said that the descriptions in some cases include many interesting and valuable items not easily accessible. The facts are there, but the geographical thread that would make the volume geographically sound is often lacking. As an account of a traveller's personal impressions of a far country, the volume is a source of pleasure to the layman; as a source of reference, it is disappointing, partly because the spirit of the book does not tend to make it a reference volume and partly because of the lack of an index. R. E. D.

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NEW MAPS.

NORTH AMERICA.

GENERAL LAND OFFICE MAPS.

UNITED STATES.—Showing Routes of Principal Explorers and Early Roads and Highways. Washington, D. C., 1908. Judging from discrepancies occurring in maps issued by departments of the Government, a general censor or supervisor would appear sometimes to be needed. Often one bureau will maintain an error for years after it has been corrected on every other map published. For example, the Land Office continued to print "Sanup Plateau" for "Shewits Plateau," in Arizona, for, perhaps, a decade after the accepted name had been promulgated.

But, in dealing with matters of history any bureau of the Government ought particularly to be painstaking, and it is disturbing to look upon a map coming from the General Land Office, with a date so recent as 1908, purporting to show "Routes of Principal Explorers and Early Roads and Highways," some of which are drawn 100 or 200 miles out of the way. In the map under consideration the mistakes are beyond the bounds of patience, because they are so wide of the truth, and so inexcusable, all the data being well known.

In the first place, the route of Cabeza de Vaca is ignored altogether, although Narvaez is recorded in Florida. It would be a formidable task to indicate all the errors on this map, but there are two so misleading that they must not be passed by. The greatest divergence, perhaps, is in the trail of Escalante. From Santa Fé to Utah Lake this is not right even for a general plat. It strikes too far, and too directly north on the start, and then returns too far south. Next, it is drawn too far to the west and enters Utah too soon. Then it crosses Green River miles below the mouth of the Uinta, when it should go north of it some twenty miles through the open valley which is there. Again, after reaching Utah Lake a spur is thrown out to Salt Lake, yet Escalante seems not to have gone north of Utah Lake. As far south as St. George, Utah, the route is near enough for a general plat, but at St. George it is given an extraordinary turn. Instead of swinging to the eastward as we know Escalante did in his effort to cross the Colorado, this

map takes him on further south to the end of the Grand Canyon, where he is put beyond the Colorado River over three hundred miles, as the river runs, below the place where he actually did cross. From there he is taken east on the south side of the Grand Canyon, whereas he went north of it. From the neighbourhood of St. George, instead of the course shown on this map, he turned southeast, and east, following along the base of the Vermilion Cliffs, mainly under the guidance of Pai Utes, till he came to the "Ute Ford," where he crossed. This ford is approximately where the boundary between Utah and Arizona intersects the Colorado River, and it has ever since been known as "El Vado de los Padres" (The Crossing of the Fathers).

The second particularly misleading thing on the map is the trail of Bonneville, which, apparently, takes him to California and down to the Colorado at the mouth of the Yuma. Bonneville, of course, did not himself go to California. A party of his men did, and they divided at Monterey, some going north and some southeast to the Colorado, reaching the latter, not at Yuma, but at Mohave, more than a hundred miles north of Yuma. The date of Hudson's entrance into Hudson Bay is given as 1608 instead of 1609. It is not necessary to indicate further discrepancies. The Land Office should now publish a correct map of this kind to supersede the very erroneous one here mentioned; and the trail of Robert Stuart should not again be forgotten. F. S. D.

ATLASES.

Atlas of Maps and Seismograms accompanying the Report of the State Earthquake Investigation Commission upon the California Earthquake of April 18, 1906. Carnegie Institution, Washington, D. C., 1908. This large folio contains 25 maps and 15 sheets of Seismograms on which are reproductions, mostly from photographic copies, of the records of the California earthquake obtained at about 70 seismographic stations throughout the world. Most of the maps are Geological Survey topographic sheets or Coast Survey charts on which are imposed geomorphic features, the San Andreas Rift, known faults, traces of fault, distribution of earth movement, apparent intensity of the earthquake shock and other seismic phenomena. Maps of San Francisco and Santa Rosa show the areas of destruction by earthquake and the subsequent fires, and another map shows geological profiles with corresponding intensity curves across San Francisco. A geomorphic map of California and Nevada with parts of Oregon and Idaho show the diastrophic character of the relief, the steep descent from the subcontinental shelf to the floor of the Pacific and the more apparent faults in California. The Atlas contains the finest series of maps yet produced to illustrate the causes, phenomena and effects of a great earthquake.

Atlas of the Chinese Empire containing separate Maps of the 18 Provinces of China Proper on the scale of 1:3,000,000 and of the 4 great Dependencies on the scale of 1:7,500,000. With an Index to all the names on the Maps, a List of all Protestant Mission Stations, etc. Specially prepared by Mr. Edward Stanford for the China Inland Mission. The China Inland Mission, London and Philadelphia, 1908. Price, $4.

For commercial, missionary and general purposes these 22 sheets form the best map of China that has yet been produced. Its great lack is that it gives no representation of the surface features excepting hydrography, which is clearly presented. But this deficiency has made it possible to print a very large number

of place names and routes. The spelling of place names is that which has been adopted by the Chinese Imperial Post Office, so the atlas presents a standardized, uniform English spelling of Chinese and other geographical names. Railroads and telegraphs are indicated and the relative importance of towns is clearly marked. The atlas is a work of great labour and care and its price is small considering the merits of the product.

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